ANNUAL REPORT

1961-1962

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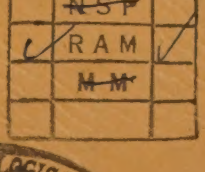
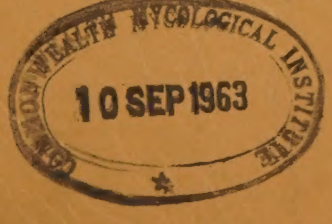
DEPARTMENT OF AGRICULTURE

NEW SOUTH WALES





1962
(SECOND SESSION)

PARLIAMENT OF NEW SOUTH WALES

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OF THE

DEPARTMENT OF AGRICULTURE
NEW SOUTH WALES

FOR THE

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AS AT 30th JUNE, 1962

DEPARTMENT OF AGRICULTURE*

Minister for Agriculture and Conservation	Hon. A. G. E. Enticknap, M.L.A.
Director-General	Dr. G. Edgar.
Director of Agriculture	Dr. H. J. Hynes.
Secretary	Mr. J. L. Hager.
Accountant	H. J. Chardon.
Chief Clerk	S. W. Wise.
Personnel Officer	C. B. Campbell.
Pastures Protection Officer	E. J. Power.
Legal Officer	S. T. Beal.
Architect	H. A. Browne.
Chief Biometrician	F. C. McCleery.
Chief Research Liaison Officer	Dr. S. L. Macindoe.
Division of Plant Industry—	
Chief	W. H. G. Poggendorff.
Deputy Chief	A. C. Orman.
Principal Agronomist (Pastures)	C. K. Vears.
Principal Agronomist (Research)	N. S. Shirlow.
Principal Agronomist (Extension)	G. Nicholson.
Division of Horticulture—	
Chief	H. W. Eastwood.
Deputy Chief	J. A. Ballantyne.
Principal Fruit Officer (Extension)	R. G. S. Kebby.
Principal Fruit Officer (Research)	B. O. French.
Senior Inspector (Export and Import Branch)	L. T. Bilbe.
Division of Animal Industry—	
Chief	R. M. Watts.
Deputy Chief	R. A. Hall.
Director of Veterinary Research	J. C. Keast.
Principal Veterinary Research Officer	E. J. H. McBarron
Chairman, Board of Tick Control	J. N. Henry.
Principal Veterinary Officer	N. K. Golding.
Principal Veterinary Officer (Meat Inspection)	R. C. Cramp.
Principal Livestock Officer (Sheep and Wool)	C. J. Hawkins.
Principal Livestock Officer (Beef Cattle, Horses and Goats)	W. J. B. Murphy.
Principal Livestock Officer (Pigs)	G. M. D. Carse.
Principal Livestock Officer (Poultry)	V. H. M. Brann.
Principal Livestock Officer (Apiculture)	A. A. Clemson.
Division of Dairying—	
Chief	A. C. Small.
Deputy Chief	J. D. L. McGibbon.
Principal Dairy Officer	Vacant.
Principal Dairy Officer (Herd Improvement)	F. A. Vernon.
Division of Science Services—	
Chief	Dr. C. J. P. Magee.
Chief Biologist	W. S. Sutton.
Chief Entomologist	S. L. Allman.
Chief Chemist	T. H. Johns.
Director of the Royal Botanic Gardens and National Herbarium and Chief Botanist	R. H. Anderson.
Division of Information Services—	
Chief	H. Parry Brown.
Editor of Publications	R. J. K. Synnott.
Organiser, Agricultural Bureau	J. J. Slater.
Senior Extension Officer (Women's Service)	Miss N. M. Foskett.

* For details of staff of the various Divisions, Branches, etc., see New South Wales Department of Agriculture brochure " Directory of Officers ".

For staff number totals see tabulation in this Report, page 20.

As at 30th June, 1962

Department of Agriculture—*continued*

Regional Extension Services—		
Chief		J. L. Green.
Regional Supervisors of Agriculture—		
Southern Region		R. C. Madsen.
North Coast Region		S. R. Ballard.
Western Region		B. D. Ament.
South Coast and Tablelands		R. W. Shelley.
South-Western Region		G. A. Crawford.
Northern Region		G. R. Godden.
Mid-Coast and Hunter Region		H. A. Grantham.
Mid-Western Region		F. J. Nicholson.
North-Western Region		J. A. O'Reilly.
Hawkesbury Agricultural College—		
Principal		B. Doman.
Deputy Principal		W. McCarrol.
Farm Supervisor		T. Adams.
Wagga Agricultural College and Experiment Station—		
Principal		F. C. Butler.
Farm Supervisor		J. G. Ballantyne.
Wagga Agricultural Research Institute—		
Director		Dr. A. T. Pugsley.
Experiment Farms and Research Stations—		
Chief, Experiment Farms and Stations Branch		A. Pearson.
Bathurst Experiment Farm	Manager	C. H. Mort.
Condobolin Experiment Farm	Manager	J. C. England.
Cowra Experiment Farm	Manager	J. M. Arthur.
Dareton Viticultural Research Station	O.I.C.	F. S. Oldham.
Glenfield Veterinary Research Station	Director	J. C. Keast.
Grafton Experiment Farm	Manager	C. E. Collins.
Griffith Viticultural Research Station	O.I.C.	A. F. Murray.
Leeton Experiment Farm	Manager	C. R. Hood.
Narrabri Experiment Farm	Manager	K. F. Flemons.
Narara Horticultural Research Station	Manager	L. F. Mandelson.
New England Agricultural Research Station, Glen Innes	Manager	E. Tindale.
Poultry Research Station, Seven Hills	Manager	D. C. Duncan.
Tamworth Agricultural Research Station	Manager	J. A. Loveridge.
Tamworth Agricultural Research Station	Director of Research	Dr. W. V. Single.
Temora Experiment Farm	Manager	R. Thomson.
Trangie Agricultural Research Station	Manager	J. H. Ballard.
Wollongbar Agricultural Research Station	Manager	F. A. York.
Yanco Agricultural Research Station	Manager	F. D. Mackenzie.
Alstonville Tropical Fruit Research Station	O.I.C.	D. S. Leigh.
Dairy Industry Research (North Coast)	Supervisor	W. J. C. Hudson.
Division of Marketing and Agricultural Economics—		
Chief		C. J. King.
Principal Economics Research Officer		P. C. Druce.

NEW SOUTH WALES

DEPARTMENT OF AGRICULTURE

Report of the Director-General to the Minister for the Year ended 30th June, 1962

Department of Agriculture,
Sydney, 16th October, 1962.

Dear Sirs,

Herewith the Report of the Department of Agriculture for the year ended 30th June, 1962.

CENTRAL ADMINISTRATION NOTES

Death of Retired Permanent Head, Mr. E. O. Tout, O.B.E.

Mr. E. O. Tout, O.B.E., Under Secretary and Permanent Head since 17th May, 1959, retired on 20th August, 1961, after 49 years of service.

Deserving tributes were paid to his administrative ability and long and loyal service to the Department and the State.

Mr. Tout joined the Department in 1912 as a junior clerk. In 1923, he was appointed Accountant, Grain Elevator Branch (Bulk Handling of Wheat); in 1924, Accountant, Grain Elevator Construction Branch; and in 1926, Senior Inspector of Accounts. In 1930 he was promoted to Assistant Accountant; in 1941, Accountant; and in 1943, Assistant Under Secretary.

I record with deep regret the death of Mr. Tout on 28th June, 1962, less than a year after retirement. He had been ill throughout those months.

Mr. Tout's death has bereaved the community, and his former colleagues in particular, of a sincere and kindly gentleman, a man of great experience and wisdom.

The Late E. O. Tout, O.B.E.

With deep regret this Report records the death of our former Permanent Head on 28th June, 1962, less than a year after his retirement.

Australian Agricultural Council and Standing Committee on Agriculture

The Australian Agricultural Council met on one occasion, in February, 1962, at Sydney. Two meetings of the Standing Committee on Agriculture were held; one in October, 1961, and one in January/February, 1962, both in Sydney.

Some major items discussed were: wheat and meat exports; margarine quotas; tobacco industry; honey marketing stabilisation plan; antibiotics in milk; tractor testing; shortage of veterinarians; and swine fever.

Farrer Memorial Trust

The Trustees of the Farrer Memorial Research Scholarship Fund held an annual and four ordinary meetings.

Several changes in personnel of the Trust occurred this year, as follow: Dr. Grahame Edgar succeeded Mr. E. O. Tout, O.B.E. (retired) as Chairman of Trustees on 21st August, 1961; Mr. G. McCorquodale was appointed a non-official Trustee in place of Mr. A. McCorquodale (deceased); Mr. A. Pickering, a non-official Trustee, resigned; and Mr. B. Doman succeeded Mr. H. R. Richardson as official Trustee when the latter resigned from the position of Principal of Hawkesbury Agricultural College.

The annual Farrer Memorial Oration for 1961 was delivered by Professor H. C. Forster, Ph.D., M.Agr.Sc., Professor of Agriculture and Dean of the Faculty of Agriculture, University of Melbourne, at the Agricultural Bureau State Congress, Hawkesbury Agricultural College, 11th July, 1961. His subject was "The Potential for Agricultural Settlement in the Northern Territory", and the text was later published in the *Agricultural Gazette*. Professor Forster was presented with the 1961 Farrer Memorial Medal in recognition of distinguished services to agricultural science.

The Farrer Memorial Research Scholarship held by Mr. P. W. Ellyard, B.Sc.Agr., Soil Chemist, New South Wales Department of Agriculture, expired on 3rd January, 1962.

Royal Botanic Gardens and Government Domain Trust

One meeting of the Royal Botanic Gardens and Government Domain Trust was held. Matters discussed included: a request for an area in the Domain for helicopter landings; and a proposal for development of the existing Domain Baths at Woolloomooloo.

The Honourable J. B. Renshaw, M.L.A., was appointed to the Trust following the resignation of the Honourable R. B. Nott. Following the resignation of Mr. Renshaw, the Honourable A. G. Enticknap, M.L.A., was appointed as Trustee.

The Expressway through the Royal Botanic Gardens and Domain was opened for traffic on 1st March, 1962, and considerable attention has been given to the restoration of the areas affected. The Entrance Gates have been shifted to new sites and plans drawn up for the landscaping of the surrounding areas.

Finance—Summary

The net expenditure from Consolidated Revenue Fund on the investigational, educational and associated administrative activities during the year amounted to £3,143,289. This does not include expenditure of £1,029,364 on cattle tick control (of which £311,804 was contributed by the Commonwealth) or £142,544 for the maintenance, etc., of the Royal Botanic Gardens and Allied Activities. This latter amount includes £6,967, the cost of maintenance of gardens at Admiralty House, reimbursed by the Commonwealth.

Receipts on behalf of Consolidated Revenue Fund amounted to £1,083,935.

Buildings and improvements of a permanent nature were constructed to a total cost of £249,166. This was met from Loan funds allocated to this Department, £160,222, and £88,944 from the Loan Vote of the Department of Public Works.

Details of the Accounts of the Department, including numerous Special Deposits Accounts, opened with the Treasury in terms of the Special Deposits Act of 1911, are presented in the *Appendix I* to this Report.

Capital Works

The Department has in hand for completion in 1962-63 capital works estimated to cost £191,000, such as buildings and water supply.

Commonwealth Grant for Agricultural Advisory Services

This grant, to enhance extension services and their effect, is to continue until 30th June, 1965. Since its inception in 1952-53, this State has received amounts varying from £50,000 to £75,000 per annum. As from 1st July, 1960, the total grant to the States has been fixed at £300,000 per annum, of which New South Wales will receive £75,000 annually.

More detail of the effect of this grant is provided in other sections of this Report.

Commonwealth Grant for Dairy Industry Extension Services

The total amount made available to the States under this grant to enhance extension services and their effect on the dairy industry is £250,000 per annum; New South Wales receives £66,880 annually. The grant is to continue until 30th June, 1963, when it may be renewed for a further period.

Further detail of the effect of the grant appears in other sections of this Report.

Industry Funds for Research

The Department continued to receive allocations of industry funds; through the Wool Research Committee, the Wheat Industry Research Committee, the Wheat Industry Research Council, the Australian Dairy Produce Board and the Tobacco Advisory Committee. In the case of the Australian Cattle and Beef Research funds there has been considerable delay, through objections to the method of implementing the levy. Now, £22,020 has been made available for beef research in the State during 1962-63.

Following are the more important projects for which funds have been provided. The amount made available for the respective project during 1961-62 is shown:—

Wool Research Committee Funds.—Control and Biology of Itchmite in Sheep, £3,250; Insecticide Resistance in Sheep Blowflies, £1,600; Efficiency of Wool Production, £2,503; Influence of Season on Ram Fertility, £1,000; Control of Galvanized Burr with Pastures, £2,050; Black Soil Scarab, Field Assistant, £1,200; Serrated Tussock Control, £3,200; Development of Shannon Vale Station, £8,000; this was towards re-establishment of the station, to initiate certain feeding and breeding trials.

Wheat Industry Research Committee Funds.—Soft Wheat Quality Programme, £5,000; Relation of Soil Nitrogen and Moisture to Wheat Yield and Quality, £2,000; Effects of Improved Pastures on Soil Fertility and Economics of Pasture Crop Dressing, £4,410; Intensity of Cropping on Improved Country, £925; Effect of Moisture Utilisation by the Wheat Plant, £1,360; Wheat Granularity in Relation to Baking Quality, £500; Baking Quality in Relation to Flour Particle, Size Distribution, £200; Visit to Wheat Research Institute, N.Z., £150; Extensions to Agricultural Research Institute, Wagga, £5,000; subsequently £8,000 was made available by the Wheat Industry Research Council, and this total of £13,000 from the Committee and the Council has now been increased by the State Treasury to £50,000—the amount needed for additions to the Institute.

Wheat Industry Research Council Funds.—Wheat Grading Survey, £4,000; Training a Wheat Geneticist, £1,800; Root Rot Publication, £550; Additions to Agricultural Research Institute, Wagga, £8,000 (see also "Wheat Industry Research Committee" in previous paragraph).

Australian Dairy Produce Board Funds.—Pasture Species Research, £3,700; Other Pasture and Animal Research, £6,500; Socio-Economic Survey of the Dairy Industry on the Far North Coast, £5,372; Problems of Blue Vein Cheese Production, £8,527.

Tobacco Industry Trust Account.—The new Tobacco Research Station at Ashford, £32,000; and an annual allocation for recurring expenses amounting to £32,400. This covers salaries and wages of relevant staff at New England Agricultural Research Station and something for salaries, wages and related expenses for the proposed Reserch Station (including £4,000 for salary and equipment for a Tobacco Chemist).

Australian Cattle and Beef Research Committee Funds.—No funds were distributed for 1961-62. The Department has now been advised of the following allocations for 1962-63:—Pastures Species and Strains, £10,900; Pasture Plant Nutrition, £4,050; Determination of available phosphate levels in North Coast Soils, £3,570; Feed and Growth Rates, £1,000; Structure and Pattern of the Industry, £2,500.

Poultry Nutrition Research.—Manufacturers of animal protein concentrates throughout the State, and members of the poultry industry and associated industries represented by the Consultative Committee to Seven Hills Poultry Research Station, have provided the finance to erect a Nutrition Research Laboratory at the Station.

The laboratory is to carry out research into the quality of animal protein concentrates used in poultry rations and designed to be used for a short-term chicken-growth assay procedure. Design has been finalised and construction will start soon.

Better Buildings and Facilities for Research

The new Division of Science Services building at Rydalmere, housing the Chemistry, Entomology and Biology Branches, at a cost of about half a million pounds, was officially opened.

The laboratory and administrative building on Tamworth Agricultural Research Station was officially opened. It was built at a cost of £80,000 and is now partly staffed. Additional experienced officers are being sought.

Building of a new laboratory and administrative block at Leeton Station is proceeding. The block will assist the Department's beef research programme centred there.

There are also adjacent recently provided laboratories and facilities at Yanco Agricultural Research Station. There, horticultural and rice research are in progress.

Considerable improvement has been made in the laboratory facilities at Wollongbar Agricultural Research Station, financed in part from Dairy Research Funds.

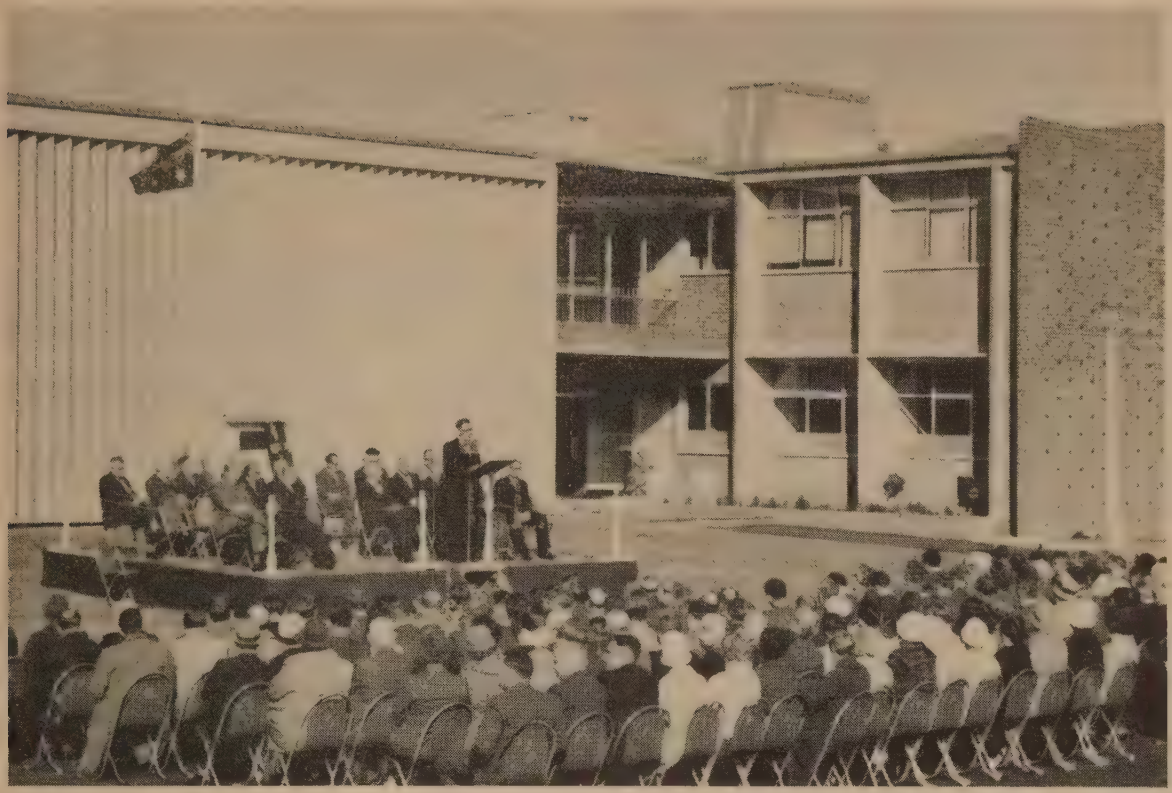
Unfortunately, the small laboratory at the Tropical Fruit Research Station, Alstonville, is not yet in use because of Division of Horticulture inability to recruit research staff.

Development of the Cattle Tick Research Station, Wollongbar, is proceeding rapidly (see the "Division of Animal Industry" section of this Report).

Additions estimated to cost £50,000 are being planned for the Agricultural Research Institute, Wagga.

Farm Management Advisory Service

The appointment of an Economics Research Officer respectively to regional headquarters at Wagga and Tamworth, early in 1962, has launched the implementation of an advisory service in farm management. This is to be integrated with the existing technical advisory services of the Department. Eventually, as trained agricultural economists become available in sufficient numbers, an Economics Research Officer will be located at the headquarters of each of the Department's nine regions.



Science Services Laboratories, Rydalmere, Officially Opened

The Deputy Premier and (then) Minister for Agriculture, the Hon. J. B. Renshaw M.L.A. on July 28, 1961, Officially Opened the £500,000 laboratories block and headquarters of Division of Science Services. The Biology, Entomology and Chemistry Branches are there. Botany Branch is still at the National Herbarium, in the Royal Botanic Gardens.

As a further part of the programme for a farm management extension service, in-service training in farm management principles and methods is being organised for all extension officers of the Department. The training is in the form of short, in-service training schools. The first two such farm management schools were held in 1962 at Tamworth and Wagga.

Agricultural Machinery Advisory Service

Funds from the Commonwealth Extension Services Grant have enabled the appointment of two Agricultural Machinery Officers, one to the South-western and one to the Western Agricultural Region. Similar appointments to other regions have been programmed.

The Machinery Officers' main duty is to advise farmers on all matters pertaining to use and maintenance of machinery and allied equipment on farms.

The service germinated in 1960 with the appointment of an Agricultural Engineer. He has been engaged partly in extension work. Plans have meantime proceeded for expansion to country centres. The Engineer has devised the expansion programme and accumulated data on which the District Machinery Officers, breaking ground in a new area of extension, will build their action plans.

Actions on Agricultural College Courses

Last year's Report mentioned recommendations made by a committee set up by the Public Service Board concerning Agricultural Diploma courses. Action has been taken on these recommendations as follows:—

(1) Establishment of an Advisory Committee: Members have been appointed to this committee; the first meeting has been held on 1st May, 1962.

(2) Standard of Entry to Diploma Course: Following implementation of the Wyndham Report in the Secondary Schools, the minimum entry requirement for the Diploma Courses should be the four-year School Certificate, with the proviso that certain standards in some subjects might be required in the future. As from the start of 1963, the only Intermediate Certificate holders accepted for enrolment at the Colleges would be those who had passed at the External Examination; except those who had passed at the Internal Intermediate Certificate examination prior to 1962.

(3) Raising the Standard of the Diploma in Agriculture: The content of the course is now being examined and will be subject to suggestions from the Advisory Committee.

(4) Introduction of a Three-term Year: The long-standing system of two academic sessions per annum ended in 1961. A three-term year commenced in 1962. Modification of vacation-work arrangements has been embodied. Henceforth, students have to gain at least eight weeks' experience on two or more private farms as a prerequisite to their diploma.

Farm Certificate (One-Year) Course at Yanco

A Farm Certificate Course of one year's duration is to be started at Yanco Agricultural Research Station, commencing in January, 1963. A Departmental Committee has formulated details of the course, and considered staff and equipment problems.

This course is intended specially for farmers' sons, or others intending to go on the land either as managers or to work their property. It will not have the professional status of a Diploma in Agriculture, and therefore is not a course for any who plan to enter government services as extension officers or private industry as technical advisers. The standard of entry will be the Intermediate Certificate.

Some Developments Affecting Field Crops and Pastures

Effect of Cotton Research

After three years of successful cotton research at Narrabri Experiment Farm, wide public interest has centred on the first commercial crops of cotton to be grown under irrigation in the north west. Other commercial crops of cotton are being grown under irrigation in the south.

Some 2,000 acres of commercial cotton were sown and, although 1,600 acres failed through circumstances beyond the control of two major growers, the yields from 400 acres clearly showed that cotton can be profitably grown in this State.

Because of widespread interest in it and the economic potential, an agronomist from Narrabri Experiment Farm is now in the U.S.A. for a year to study all aspects of cotton production. The information and experience he gains will benefit present and intending cotton growers in New South Wales and help to establish the industry soundly.

Long-grained Rice

By selection, the Department has provided growers with a very suitable strain of a long-grained variety, Bluebonnet 50; and enough pure seed of it has already been produced to sow a big part of the commercial rice areas.

The industry was becoming less profitable because of the lower demand and collapsed price offered for short-grained rice such as Caloro II. Five years ago Caloro II was worth to growers £40 a ton of paddy; today, only £25. Release of the selected strain of the long-grained Bluebonnet 50 should go far towards prosperity restoration in the industry.

Tobaccos Bred in N.S.W. to be Grown in Europe

The blue mould-resistant Hicks A1 and A2 strains bred in N.S.W. are being well received, despite opinion differences on quality as compared with the Hicks parent.

European countries, notably France and Italy, have obtained from Australia substantial quantities of seed of the blue mould-resistant strains at a high price. They are expected this year to plant 130,000 acres with them, to prevent heavy losses from blue mould. These large areas of Australian-bred blue mould resistant tobaccos will be grown in Europe whilst Australian manufacturers are hesitating about general release and assessing quality.

Prospects for a Ramie Industry

For years now this Department has been helping an attempt to promote production of the ramie plant as a source of high quality fibre. Some years ago a simple method for economic decortication and processing of this fibre was patented by a party, whereas these aspects had been previously proved extremely expensive.

The Australian owners of the patented process have recently announced that they have been able to interest the principals of an overseas organisation which has bought the rights to the patent. This could be of economic importance to farmers in some parts of New South Wales.

New Wheat Stem Rust Strains

The stem rust position as affecting wheat varieties altered significantly. Strains of stem rust now in the field can attack all varieties of wheat now grown in this State. The rate of build-up of spores of the new strains will determine the immediate effect on the industry.

The plant breeders in New South Wales have commenced yield-testing hybrids resistant to the new rust strains.

Tests of Falcon Wheat

Extensive milling and baking quality tests were done on the new wheat variety Falcon. An innovation was large-scale testing of it by several commercial mills. These large-scale tests in general confirmed the Department's opinions on Falcon.

Wheat Breeding for Frost Tolerance

The demonstration of simple inheritance of a vernalization response in spring wheat varieties has been of great theoretical and practical significance. This is the first demonstration of its kind in wheat. It should find direct application in the production of new varieties adapted to southern New South Wales and in providing a useful way to minimise frost damage in this State.

Registered Cereal Seed Scheme Expanded

One hundred and twenty-four Seed Wheat growers, 100 Registered Seed Oat growers, and 13 Registered Seed Barley growers, with supervision by District agronomists, and using Foundation Seed supplied by the Department's Experiment Farms and Stations, grew Registered Seed for supply of approved varieties to other farmers.

Outstanding New Oat—Cooba

The dual-purpose crossbred oat formerly known as M.1010 has been registered as Cooba and released for general cultivation. Extensive trials have shown Cooba to be more productive than all currently grown varieties. Cooba is suitable for heavy grazing, early in maturity after grazing, acceptable as a milling variety, and has resistance to the oat smuts and crown rust. It is being recommended for trial sowings in Southern New South Wales for the first time in 1962.

Hybrid Grain Sorghum Now Grown Commercially

Hybrid grain sorghum was grown commercially for the first time in N.S.W. Performance of some hybrids was highly satisfactory. Yields of 80 bushels per acre were obtained from large areas sown by a few landowners.

Trials showed that hybrids will increase grain sorghum yields throughout the State. Yields up to 50 per cent higher than those from open pollinated varieties were obtained.

Production of Certified Hybrid Grain Sorghum Seed in N.S.W. will proceed.

Herbicides for Weeds in Cereals and Lucerne

Weed control work has been highlighted by important developments in control of annual grass weeds in cereals and lucerne. Barban and di-allate have been introduced for control of wild oats in wheat. In rice, 3-4-dichloropropionanilide has been successfully used for barnyard grass control. In maize and broom millet, atrazine has been applied to control summer grass and barnyard grasses. In lucerne, 2-2-DPA is finding a place for barley grass control.

Farmers have treated at least 4,000 acres with these herbicides.

More Grazing Lucerne

The Department has long recommended lucerne pasture for areas outside the range of adaptation of conventional pasture grasses and clovers. But, in general, there was too little farmer interest in grazing lucerne.

In recent years the farmer disinterest has changed remarkably. In the central west, for example, the area under sown pastures increased from 35,000 acres in 1951 to 850,000 acres in 1961; and, of this total, 750,000 acres is estimated as sown to grazing lucerne. Also in the north west there is increasing interest; in use of lucerne as a 3 or 4-year ley in a wheat-pasture rotation, just as Subterranean clover is used in other areas.

This is a marked and desirable contrast to the older tendencies to leave lucerne stands down for many years and to regard the areas as something apart from the farm cropping programme.

Superphosphates Increased Use on Pastures

Usage of superphosphate on sown pastures was a few years ago quite inadequate for the pastures to achieve their production potential. Recent years' statistics show a very desirable trend. Whereas between 1955 and 1961 the area of sown pasture increased by about 30 per cent, the quantity of fertilizer used on sown pastures increased by almost 100 per cent.

Outstanding Merino Research at Trangie

By selection for greasy fleece weight, Trangie Agricultural Research Station has raised a normal flock to a wool-cut level much higher than that of the stud sheep grazed and run on the Station under normally accepted breeding and management methods. Over the short period of ten years the Trangie selection work has raised the wool-cut on an ordinary flock by almost 1½ lb. per head.

By breeding for increased fertility, the Station has developed a strain of plain bodied open-faced Merino sheep which, whilst maintaining a good wool-cut per head, show an increase of 44 per cent in number of lambs weaned in comparison with the group showing marked body wrinkle.

Evidence of graziers' interest in the projects has been shown by their attendances at the Station's Field Days.

Some Developments Affecting the Dairying Industry

Summer Legumes for North Coast Dairying

A critical factor in north coast dairy farming has been lack of forage quality and quantity, late in summer and in autumn. Since 1952 the Department has been seeking suitable legumes to fill this gap. Large numbers of plants from areas of comparable climate in other parts of the world have been tested. The C.S.I.R.O. plant introduction service has assisted.

Evaluation of the plants has not only required the assessment of agronomic characters, but also toxicity tests. Many of the species examined are not used for grazing in their country of origin; and many tropical and sub-tropical species have poisonous principles. Another problem has been lack of seed of the plants in commercial quantities; testing and commercial utilisation has depended entirely on production of the seed in Australia.

From the many species and varieties tested, interest is now narrowed down to selected varieties of *Glycine javanica, Dolichos lab lab, Desmodium uncinatum* and *Lotononis bainesii;* and in 1962 the Department established the first field-scale seed-production areas of these. Much of the seed produced from these areas will be used to establish further seed-increase areas. Enough seed to establish grazing areas in expected soon.

This establishment of the commercial seed areas is a culmination of the ten years of intensive research. Use of the new legumes by north coast farmers will have a marked effect on the economy of dairy and beef production there.

Milking-Machine Efficiency Survey

The five Milking-Machine Survey Officers operating are visiting farms at a rate exceeding 1,000 per year. Thus the Survey is having a strong influence to the good of the industry.

The results collated last year from the 1957 to 1960 figures are now being disseminated through all appropriate extension channels.

About 85 per cent of the machines examined have been found to be unsafe milkers with various faults. The need for close scrutiny of this important phase of production has been clearly shown.

Pasteurised Milk for Cheese

Action under the Dairy Industry Act to require that the milk used for cheese manufacture be pasteurised has been completed. Now, all cheese milk in this State has to be pasteurised. Thus, there is greatly improved cheese quality and elimination of a health hazard that was causing concern to the industry and health authorities.

Herd Recording for Dairy Production Improvement

The Scheme gives members reliable basic information for a programme of herd improvement to increase production efficiency. This year the number of herds and cows undergoing Official Herd Recording respectively increased from 220 to 230 and 8,700 to 10,000.

The Herd Recorder staff now totals 91; including eight Herd Organisers, 76 Herd Recorders and seven Relief Herd Recorders.

Some Developments Affecting Fruit Industries

Fruit Fly Control and the N.Z. Market for Oranges

New Zealand authorities have now accepted the ethylene dibromide fumigation treatment for disinfestation of oranges. This will allow fruit to be exported to New Zealand from districts not free from fruit fly.

The research which led to this post-harvest treatment of oranges and New Zealand acceptance of the method was done by officers of the Department of Agriculture at the Citrus Wastage Research Laboratory, Gosford, under the direction of The Technical Committee on Fruit Fly Sterilisation Investigations on Citrus.

Control of Mould in Citrus

For control of green mould wastage the value of introducing ammonia gas into ethylene de-greening chambers has been confirmed. A simple method, by heating a concentrated solution of ammonia hydroxide, has been shown to be effective.

Control of Apple Scald

Superficial Scald has been a major problem in the cool storage of Granny Smith apples. Department of Agriculture research staff in collaboration with the C.S.I.R.O. have demonstrated control of the condition by diphenylamine treatment of the fruit; a treatment likely to be widely used.

Virus Diseases of Deciduous Fruits

Dr. A. F. Posnette, a world authority from England on virus diseases of stone and pome fruits visited the Division of Science Services, and accompanied plant pathologists and fruit officers on a survey of orchards in major fruit producing districts. His knowledge greatly increased the local knowledge of the virus disease situation in N.S.W. Development of virus-free mother lines as a source of propagation material has gained impetus.

Towards controlling the spread of virus diseases in deciduous fruit trees, the Department three years ago introduced a scheme for voluntary inspection of sources of propagating material. Thirteen nurseries, representing over 95 per cent of all deciduous tree production, have entered the scheme this year. The fruit industry will benefit considerably; because most trees in future will be propagated from selected sources, inspected and approved by the Department.

Wine Grape Vintage and Quality

Production of grapes in the M.I.A. for the 1961-62 season was 8 tons per acre, a record vintage. Satisfactory prices and the high yields gave growers their highest returns ever. Improvement in overall quality of wines made in New South Wales has continued, through adoption of better production methods and modern plant in wineries.

Swine Fever Eradication Campaign

The Swine Fever eradication campaign was vigorously continued; but, whereas at the close of 1960-61 it seemed that the main centres of infection were the outer metropolitan areas of Sydney and Newcastle, it has become evident that the disease is widespread in the State. On the other hand, mortality for the most part is low.

Mortalities on 1,006 properties were investigated this year, and pigs on 99 properties where Swine Fever was confirmed were destroyed. The total number of pigs destroyed this year was 13,804. Payment of compensation amounting to about £150,000 was involved.

Staff Section

Appointments-Promotions.—Dr. G. Edgar as Director-General, from Assistant Under Secretary; Mr. J. L. Hager as Secretary, from Legal Officer; Mr. B. Doman as Principal, Hawkesbury Agricultural College, from Principal, Wagga Agricultural College; Dr. F. C. Butler, as Principal, Wagga Agricultural College, from Senior Research Officer, Agricultural Research Institute, Wagga; Dr. R. N. McCulloch as Director, Cattle Tick Research Station, Wollongbar, from South Australia; Mr. G. Mason as Special Economics Research Officer (Irrigation); Mr. H. A. Grantham as Regional Supervisor, Mid-Coast & Hunter Region; Mr. E. C. Connor as Assistant Principal Fruit Officer (Extension); Mr. G. M. Halloran as Senior Research Officer, Agricultural Research Institute, Wagga; Mr. A. N. Smith as Senior Research Officer, Agricultural Research Institute, Wagga; Mr. K. J. Symes as Senior Research Officer, Agricultural Research Institute, Wagga; Mr. C. W. Lattimore as Special Dairy Officer (Butter); Dr. G. J. F. Smith as Special Dairy Officer.

Retirements-Resignations.—Mr. E. O. Tout, Under Secretary; Mr. I. W. Scott, Deputy Chief, Division of Dairying; Mr. H. R. Richardson, Principal, Hawkesbury Agricultural College; Mr. J. T. Dickson, Special Dairy Officer; Mr. V. F. Byrne, Deputy Senior Inspector, Export and Import Branch.

Deaths.—Mr. F. I. Lane, Inspector of Accounts; Mr. J. Meade, Lecturer, Hawkesbury Agricultural College.

Departed for Overseas.—Mr. D. I. Gillies, Dairy Officer, accepted a Colombo Plan six months assignment in the Philippines on behalf of the Commonwealth Government; Mr. R. R. Sculze, Agronomist, departed for the U.S.A. in April, 1962, for 12 months study of cotton production; Mr. B. J. Swann, Cadet, awarded a University of California scholarship, was granted 12 months study leave to accept it; Mr. G. M. Halloran, Senior Research Officer, Agricultural Research Institute, Wagga, was granted two years leave to study wheat genetics in the U.K. on a scholarship from the Wheat Industry Research Council.

Returned from Overseas.—Mr. J. L. Green, Chief, Regional Extension Services, resumed duty on 5th October, 1961, after visiting the U.K. and Europe and attending the Ninth International Training Centre at Wageningen, Netherlands, on extension methods and programme planning; Drs. G. J. F. Smith, Dairy Officer, F. G. Swain, Agronomist, and R. J. Richards, Bacteriologist, resumed duty on completion of studies at Universities in the U.S.A.; Mr. D. I. Gillies, Dairy Officer, returned to duty on completion of a Colombo Plan assignment in Vietnam.

Visited Overseas.—Mr. K. E. Davey, Cereal Technician, Agricultural Research Institute, Wagga, visited N.Z. to undertake wheat milling and quality evaluation studies; Mr. B. G. Hall, Agronomist, visited N.Z. for the Weed Control Conference and to study weed control measures; Mr. L. Littlejohns, Veterinary Research Officer, Glenfield, visited the U.K. and U.S.A. for 4½ months to study Swine Fever control methods.

Staff Numbers at 30th June, 1962

	Public Service Board	Ministerial	Total
Central Administration*	702	13 (1)	715
Division of Science Services	117	..	117
Division of Plant Industry	161	..	161
Division of Horticulture	122	..	122
Division of Dairying	151	..	151
Hawkesbury Agricultural College	70	76 (2)	146
Wagga Agricultural College	44	36 (3)	80
Experiment Farms and Stations	97	215 (4)	312
Division of Animal Industry—			
Head and District Offices	172	17	189
Meat Inspection Service	155	19	174
Queensland Border	58	1	59
Tick Quarantine Areas	50	504	554
Royal Botanic Gardens	121	..	121
	2,020	881	2,901

(1) Includes 4 casuals; (2) Includes 8 casuals; (3) Includes 3 casuals; (4) Includes 25 casuals.

* Includes Division of Marketing and Agricultural Economics and the Division of Information Services.

Personnel Branch

Induction.—New officers and employees at Head Office and metropolitan branches were inducted to their positions. New officers from overseas were met and assisted, towards easy assimilation.

The University trainees selected for 1962 attended an induction school, held at Yanco Agricultural Research Station, and a speed-reading class in North Sydney. They also toured the Division of Science Services laboratories at Rydalmere in their May vacation.

Tutorial Assistance.—Classes were organised for candidates for Reg. 116 and 119 examinations, and for efficiency allowances. Field officers were helped to prepare for the Reg. 124 examination. Study material was made available to all candidates. Study leave was approved for officers' part-time University and Technical College studies.

Counselling and Adjustment.—Advice and guidance were given to many officers, and problems of adjustment were referred to specialist officers of the Public Service Board.

Trainee-Cadet System.—Ten University trainees and seven Agricultural College cadets graduated and entered upon duty.

For the academic year 1962, 37 Departmental traineeships were made available at the University of Sydney, University of New South Wales, or University of New England, and 10 cadetships at Hawkesbury Agricultural College.

At 30th June, 1962, there were 108 trainees at the three Universities and 24 cadets in diploma courses at Hawkesbury and Wagga Agricultural College.

First Aid Service.—The service at Head Office is provided for officers of both Department of Agriculture and Department of Technical Education. The Matron and First-Aid Officer attended to 307 cases of minor indisposition or disability (144 males and 163 females). Contact was maintained with officers in hospital and in their convalescence. Adequate first-aid equipment was provided at country institutions.

Colombo Plan and F.A.O. Fellows.—The Department continued to provide for Asian students. Groups and individual Fellows from India, Burma, Indonesia, Thailand, Sarawak, Ceylon, Israel, Mexico, Kenya and Southern Rhodesia were received.

Career Inquiries.—Enquiries about careers in agriculture and livestock industry were made by career advisers, organisations, parents and students throughout the State, and from overseas. Relevant literature was supplied.

Legal and Registration Branch

Acts Passed

Agricultural Seeds (Amendment) Act, 1961.—Statutory provisions regulating the sale of agricultural seeds and prohibiting the sale of certain seeds and plants have been in force in this State since the passing of the Agricultural Seeds Act, 1921. However, the Act did not especially deal with seed produced and packed under seed certification schemes conducted by the Department or non-departmental seed certification schemes approved by the Minister. The Agricultural Seeds (Amendment) Act, 1961, remedied the position.

The Agricultural Seeds Act as now amended includes a definition of "Certified seed"; restricts use of "certified", "certificated", or words of like import in advertising or sales of agricultural seed, to seed produced and packed under a seed certification scheme conducted by the Department or a non-departmental scheme approved by the Minister; enables requirements as to repacking of certified seed to be prescribed by regulation, and prohibits unauthorised use of seals.

Domain Leasing Act, 1961.—This Act provides statutory authority for past use of two portions of the Government Domain; for an underground car parking station owned and operated by the Council of the City of Sydney, and for underground fuel oil tanks owned and controlled by the Commonwealth.

The Act also provides that the Trustees of the Royal Botanic Gardens and Government Domain may, with the consent of the Minister for Lands and for these two specific purposes, lease the relevant portions respectively to the Council and the Commonwealth Government for such terms or periods, at such rentals and subject to such covenants and conditions, as the Trustees with the approval of the Minister for Lands may determine.

Stock Diseases (Amendment) Act, 1961.—This Act amended the Stock Diseases Act, 1923, as amended, in two main respects. Firstly, it restored to their former status, of temporary employees under section 44 of the Public Service Act, certain senior inspectors of the Board of Tick Control constituted under the Stock Diseases Act; and provided that such status shall apply to persons appointed to such positions after commencement of the amending Act. Secondly, it clarified the scope of the Minister's supervisory power over the Board of Tick Control in relation to assistant inspectors and senior assistant inspectors appointed to the Board's staff.

Swine Compensation Taxation Act, 1961.—Compensation to the owners of pigs and pig carcases destroyed as suffering from disease is paid out of the Swine Compensation Fund, established under the Swine Compensation Act, 1928-1958. A stamp duty, based on pigs delivered to abattoirs for slaughter, is the main source of finance for the Fund. The Swine Compensation Act, 1961, increased the levy from sixpence to two shillings per pig delivered. Increased compensation payments, through a swine fever outbreak caused the increase.

Regulations, Proclamations

There were 25 gazettals of Regulations, 44 Proclamations and 90 Notifications.

Regulations under the Plant Diseases Act, 1924, relating to the grading of citrus fruit, were revised; and new Regulations relating to the disease Avian Mycoplasmosis were made under the Stock Diseases Act, 1923-1934.

Prosecutions

For offences under the various Acts administered by the Department, 138 persons were prosecuted.

Arbitration—Agricultural Holdings Act, 1941

One matter was referred to arbitration under the Act. The sharefarmer claimed compensation for improvements under an oral agreement. The Committee stated a case for the District Court on the question as to whether a claim for compensation by a sharefarmer under an oral agreement is enforceable by a reference to arbitration under the Act.

Registrations

Registrations effected during 1960-61 and those of 1961-62 are compared below:—

	1960-61	1961-62
Apiary registration	3,241	3,965
Potato licences	1,708	1,975
Stock foods	1,358	1,526
Stock medicines	1,756	1,782
Pest destroyers	1,866	1,712
Sheep brands	1,520	1,570
Sheep earmarks	1,847	1,869
Large stock brands	1,599	1,708
Fertilizers	622	643
Farm produce agents	303	280
Veterinary surgeons	432	451
Swine brands	2,192	2,829
Swine licences	91	305

Stock Brands Directories Improved.—To provide more up-to-date information for the public, arrangements have been made for revision and reprinting of the Large Stock Brands Directory of New South Wales, 1951; and for consolidation of Supplementary Directories.

Veterinary Surgeons Board

The Board met on nine occasions.

The prescribed examination for veterinary graduates of overseas universities was held in September, 1961. Of the five candidates, three passed.

Stock Medicines Board

Twenty-one meetings of the Stock Medicines Board were held. Some 2,086 applications for registration of medicines were received; 95 of these are still under consideration, 112 have been withdrawn, 97 have been refused; and 1,782 medicines were granted registration.

Architect's Branch

Loan and C.R. Funds Expended.—For new and maintenance works the expenditures were: Loan Funds, £160,222; Consolidated Revenue Funds, £131,324.

Work Completed.—This comprised remodelling of the kitchen at Hawkesbury Agricultural College; machinery shed, workshop, etc., at Wagga Agricultural College; fruit packing shed and men's mess at the Tropical Fruit Research Station, Alstonville; machinery shed and workshop at Condobolin Experiment Farm; improvements to water supply, additions to agrostology shed, sewerage to two cottages, laboratory facilities, and additions to No. 4 cottage at Grafton Experiment Farm; sewerage to manager's residence and alterations to laboratory, office and foreman's store at the Viticultural Research Station, Griffith; extension of machinery shed at Leeton Agricultural Research Station; cotton storage and testing laboratory, additions to manager's residence and improved water supply at Narrabri Experiment Farm; fruit packing shed and grader equipment, garage and septic tank to manager's residence at the Horticultural Research Station, Narara; men's mess and additional water storage at the Horticultural Research Station, Dareton; new officers' quarters and ablution block, hay shed, vehicle garage, cattle sheds, metabolism cage shed at Trangie Agricultural Research Station; agronomy shed and amenities room at Wollongbar Agricultural Research Station; cattle stalls at the Cattle Tick Research Station, Wollongbar; rice laboratory, new dairy, men's toilet block, and an orchard shed at the Yanco Agricultural Research Station.

Work Still Proceeding.—This includes a new general store at Hawkesbury Agricultural College; a new dormitory block, an apiary, and development of irrigation facilities at Wagga Agricultural College, sewerage facilities at Condobolin Experiment Farm; a new administration and laboratory block at Leeton Agricultural Research Station; a fruit packing shed at the Horticultural Research Station, Dareton; a new beef cattle section at Trangie Agricultural Research Station; a garage and a workshop at the Cattle Tick Research Station, Wollongbar; and remodelling of kitchen and scullery at Yanco Agricultural Research Station.

New Headquarters for Export and Import Branch, Day St., City

Export and Import Branch, Division of Horticulture, a component of the Australia-wide plant quarantine system that helps to protect our crop enterprises from exotic pests and diseases, and to maintain health and quality standards in export produce, is now newly housed in this modern building. For details of the Branch activities, see Division of Horticulture Regulatory Services, page 47.

Maintenance Work.—This comprised painting and repairs to cottages and/or farm buildings at the Alstonville Tropical Fruit Research Station, Condobolin Experiment Farm, Cowra Experiment Farm, Grafton Experiment Farm, Griffith Viticultural Research Station, Narara Horticulaural Research Station, New England Agricultural Research Station, Shannon Vale Nutrition Station, Temora Experiment Farm, Tamworth Agricultural Research Station, Trangie Agricultural Research Station, Wollongbar Agricultural Research Station, Yanco Agricultural Research Station, Glenfield Veterinary Research Station, and Queensland Border; also the desilting of tanks, sinking of bores, construction of concrete storage tanks, erection of equipment at recently desilted tanks, and maintenance of equipment, on the Public Watering Places in the Western Division.

Extension Service.—Enquiries about farm building problems were by letter and personal interview. Plans representing buildings to the value of £202,180 were supplied to farmers.

Pastures Protection Section

Rabbit Control

School for Rabbit Inspectors and Rangers.—Three schools were held. The subject matters have been considerably expanded. Instead of confining instruction to the use of "1080" (sodium fluoroacetate) as at some of the earlier schools, there are now lectures on rabbit biology, rabbit behaviour, and approach to landholders.

A day was set aside at each of two of this year's schools for Directors of Pastures Protection Boards in surrounding districts to attend for instruction. There was an excellent response. As many as twenty-five directors and officers from adjacent Boards attended the demonstrations of "1080" techniques, and machinery usage, and talks on rabbit behaviour and biology.

Boards' Increased Employment of Inspectors.—Without pressure, Pastures Protection Boards have continued to increase the number of rabbit inspectors employed. In one case, where a Board had earlier refused to employ even one, that Board now has three inspectors. In general, a great deal more interest is being shown by Pastures Protection Boards, their field officers and some landholders, than in the past.

Landholders' Regard for Inspectors.—Inspectors who have been through these schools during the last few years have a notably changed outlook on their rabbit control duties. Instead of mere policing the regulations regarding rabbit destruction, and in many cases being looked on with fear and dislike by the landholders, they now function as advisory officers. Landholders' regard for them has improved markedly. A big proportion of landholders will readily inform them of the fact that they have rabbits, and ask for advice as to the best methods of control or even eradication. These changes in outlook of the rabbit inspectors and regard for them are perhaps contributing more to rabbit control than is their training in control measures.

Acceptance of "1080".—"1080" is being more readily accepted as the most economical and efficient method of rabbit control, particularly in difficult country. The following table, drawn from records received from the Pastures Protection Boards illustrates the trend; although widespread outbreaks of myxomatosis during the first few months of 1962 led to reduced use of the poison.

Use of Liquid "1080"—*Monthly Summary*

	1960	1961	1962
	oz.	oz.	oz.
January		4,768	8,062
February		7,037	10,978
March		10,129	9,480
April	4,047	5,776	6,467
May	3,755	8,053	5,973
June	4,486	7,178	3,917
July	3,382	5,684	
August	3,076	5,167	
September	3,114	4,550	
October	5,449	6,675	
November	5,917	7,462	
December	7,720	9,811	

Plague Locust Outbreak Controlled

In the spring of 1961 hatchings of plague locust were widespread within the Bogan-Macquarie (No. 1) outbreak area. Landholders under the direction of Pastures Protection Board field officers, did a lot of work to destroy the pest in the hopper stage but, owing to rain, use of ground equipment was not always possible. Many of the hoppers matured to the wing stage and formed fairly large swarms. These moved on to the Castlereagh River, preparatory to eastern and north-eastern migration.

Officers of the Dubbo, Coonamble and Coonabarabran Pastures Protection Boards co-operated to scout the area and locate the swarms. Then the Boards hired an aircraft and sprayed all swarms located. This work was very effective. There was no escape of flying swarms from the area, nor autumn recurrence. Experiences over the last few years have shown that migratory swarms of plague locust can be destroyed by aerial spraying.

Travelling Stock Reserves

Inspections of travelling stock reserves for which applications have been made, but release refused by a Pastures Protection Board, have continued. An Assistant Field Officer (Reserves), has been wholly engaged and has substantially reduced the number. Most districts visited are now being inspected for the second or third time. Therefore, rather than continue to inspect the few reserves which are popular with many applicants, all of the stock routes in a district are in future to be inspected at the one time. Thus, better provision can be made for travelling stock, all surplus land can be withdrawn from Pastures Protection Board control, and the Pastures Protection Boards would have a more secure tenure of land remaining under their control. The Department of Lands, apprised of this decision, will supply all necessary maps and also the co-operation of the respective District Surveyor in the work.

Staff Statistics—Pastures Protection Boards

	Year ended	
	30th June, 1961	30th June, 1962
Veterinary Inspectors—		
Appointed	2	2
Retired	Nil	Nil
Resigned	5	1
Transferred	1	2
Secretaries—		
Appointed	8	1
Resigned	4	Nil
Retired	2	Nil
Dismissed	Nil	1
Deceased in Office	1	Nil
Rangers—		
Appointed	9	6
Resigned	2	4
Retired	Nil	1
Rabbit Inspectors—		
Appointed	10	21
Resigned	2	2
Retired	Nil	2
Deceased in Office	Nil	1
Promoted to Ranger	Nil	1

Biometrical Branch

General.—Design of experiments, and final statistical analysis of the results, continued as the main functions of this Branch. It designed investigational work and methods-research; and gave consultation either in the field, when plans were in preparation, or at later stages after proposals had been partly or fully formulated within Divisions. This service was available to all sections of the Department. At the end of individual investigations the Branch was again available, for mathematical-statistical examination of experimental results and for critical reporting on conclusions capable of being drawn from them.

The volume of consulting and of computing sought by Divisions increased very considerably this year, in line with the increase in active research workers. The increase in volume of computing was handled in part by increase in use of UTECOM (1 hour) and SILLIAC (4 hours).

Punch-Card Section.—This Hollerith Unit processed the records from Dairy Herd Recording, both Group and Official Sections; and produced lactation statements, monthly lists of animals completing lactation, sire surveys, annual herd summaries, and District and State summaries of production statistics. The number of animals under record in the State increased to 67,000 cows in the Group Section and 6,000 cows in the Official Section.

Research Liaison Office

Duties of Farm Managers Expanded.—Farm Managers' duties have been enlarged, to increase their general oversight, stimulation, and progress of research work at Experiment Farms and Stations.

New Projects Approved.—During 1961-62 the number of new projects registered was as follows:—Division of Plant Industry 12; Division of Animal Industry 41; Division of Horticulture 19; Division of Dairying 8; Division of Science Services: Entomology 16, Biology 19, Chemistry 22, Botanic Gardens 1; Division of Marketing & Agricultural Economics 10; Agricultural Research Institute, Wagga 3; Total—151. In addition, a number of projects registered several years ago were re-examined and formally approved.

Division of Plant Industry has initiated a new system of punch cards for all research projects within the Division. This replaces the Project Sheets system which all Divisions have used since 1939.

All Research Projects in Progress are now Registered.—In most Divisions all Research Officers have completed a schedule setting out the research projects they are engaged in and their project numbers. This useful cross-check has helped to ensure that each item of research has been approved and registered as a project. In the Divisions of Plant Industry and Horticulture, other means to this end have been adopted.

Research Staff Shortages, and Trainees.—Shortage of staff continued to hamper research in several sections. In some cases industry funds cannot be used or even sought because of inability to recruit suitably trained staff. It is hoped that such shortages will be reduced as the increased number of trainees and cadets graduate.

At present, there are 132 trainees and cadets, as compared with 109 in 1961. The numbers of trainees plus cadets appointed over the past four years have been as follows:—64 in 1959, 31 in 1960, 56 in 1961, and 46 in 1962.

The 1961 intake of 46 trainees and cadets was, however, 13 short of the number approved. While the number of trainees and cadets in training is greater than for some years past, these will be readily absorbed by existing positions. Other needed positions cannot even be considered, in view of the unsatisfactory recruitment rate.

Improving Publicity for Departmental Research.—Over the past two years some 1,200 research projects commenced since 1939 have been reviewed. About half of these are still in progress and, of these, a significant number should shortly be the subject of publication. Considerable emphasis has been placed on the writing up of research results, for scientific journals and the Agricultural Gazette. The increased emphasis on publication is meeting with some success.

Divisions and Branches have recently set up Publications Panels to stimulate publication of scientific work and to ensure that results are presented to scientific journals in a satisfactory form. Representatives of panels have been brought together in a Departmental Editorial Committee.

Some Divisions previously issued News Sheets for extension workers. These are being extended and improved in certain instances. Division of Science Services published in May, 1962, its first issue of *Science Services News.*

It has been decided to commence a new publication, *Research and the Farmer.* Issues will appear as suitable material becomes available. Usually the publication will deal with a particular farming zone or region. Compilation of *Research and the Farmer* No. 1 is proceeding, as a co-operative effort between the Agricultural Research Institute, Wagga Wagga and the Southern Agricultural Region.

The Department is co-operating with the C.S.I.R.O. to publish for extension workers a co-ordinated bulletin on the research work with soils and plants on the Northern Tablelands of New South Wales. Also the Department is providing information for a C.S.I.R.O. publication designed to advise wheat farmers of the progress of wheat research throughout Australia, much of which is being undertaken with wheat industry levy funds.

EXPERIMENT FARMS AND STATIONS BRANCH

Scope

Subject-matter work of the various Experiment Farms, Stations and Sub-stations of the Department is incorporated in the reports of the Divisions of Plant Industry, Animal Industry, Horticulture, Dairying, and Science Services, the Agricultural Colleges, and the Agricultural Research Institute, Wagga.

The Experiment Farms and Stations Branch is responsible for developmental and operational administration of—

- eighteen Experiment Farms and Research Stations;
- farm operations at Hawkesbury and Wagga Agricultural Colleges, and Glenfield Veterinary Research Station;
- plant and machinery for Division of Plant Industry projects at Berry and Graman; and for the Royal Botanic Gardens, Sydney, and the Agricultural Research Institute, Wagga;
- Farm Mechanisation Advisory Service;
- limited agricultural machinery research programmes.

The overall aims are: to provide reasonable facilities to all of the institutions, for efficient research and education programmes; and to provide an effective farm mechanisation extension service.

Developmental Aspects

Major developmental work occurred at several Experiment Farms and Research Station this year. An outline is as follows:—

Tropical Fruit Research Station, Alstonville.—Experimental plantings were extended considerably, to include areas of pineapples, bananas, pawpaws, mangoes, custard apples, avocados and macadamias. A greenhouse was fitted up and a fruit packing shed was constructed.

Experiment Farm, Narrabri.—Research programmes were extended, to include summer crops and pasture improvement, whereas the initial programme was cotton improvement and production. The irrigation layout has been extended and a lot more land graded for irrigation.

Provision has been made to more than double the irrigation water supply for more domestic water.

Nutrition Station, Shannon Vale (Glen Innes).—This Station, now under the Manager of the Agricultural Research Station at Glen Innes, is being re-organised for research. New sheep yards, renovation of the cottage, renewal of the boundary fences, and provision of an office are amongst the developments. Wool Industry Research Funds have financed the developments, for initiation of pasture and livestock research.

Agricultural Research Station, Tamworth.—The main buildings required to establish this Station properly for research were completed. The wool shed was renovated and a sheep dip provided. A large dam to store water for irrigation of plant breeding plots has been commenced. Provision has been made for another glasshouse, and an air-conditioned storage room for research.

Agricultural Research Station, Wollongbar.—Water supply has been extended and fencing has been increased at the Duck Creek Sub-station of this Research Station. At the Research Station proper, electricity has been extended, a glasshouse has been completed, and an agronomy shed and offices have been built.

Horticultural Research Station, Narara.—The orchard irrigation system on the Somersby Section has been completed, up to the present needs, and a fruit packing shed has been erected.

Experiment Farm, Condobolin.—A new machinery shed has been provided; and additional land has been cleared, for development of the crop and pasture programme. Two new silos have added 4,000 bushels of storage for grain; and there are new sheep yards.

Agricultural Research Station, Trangie.—A new beef cattle section has been provided. Additional quarters for resident officers have been completed. There are now a garage for resident officers' motor vehicles, another hay shed, and another grain silo that adds 2,000 bushels storage capacity.

Agricultural Research Station, Leeton.—Construction of a new administrative building and laboratory block has progressed. Beef cattle feed stalls and pens were erected and a machinery shed has been enlarged. Provision of permanent water outlets to the irrigation drainage system is proceeding. The Station is now almost completely fitted out with these units.

Horticultural Research Station, Dareton.—Further capital improvements included a fruit packing shed, an employees' amenities room, and completion of a large water storage tank in the irrigation system.

Viticultural Research Station, Griffith.—A further draining survey was made. More work was done on the tile drainage project. Some concrete irrigation ditches were constructed. Two farm buildings were renovated and altered, to provide modern offices.

Agricultural Research Station, Yanco.—Laboratory facilities for rice and chemical research were improved. The dairy was completed. Re-modelling of the kitchen is in progress, preliminary to development of the proposed agricultural college. A machinery shed and store was erected in the new orchard.

Operational

The Experiment Farms and Stations Branch was associated with expenditure of about £47,000 (excluding farm labour cost) in maintenance and upkeep of buildings, water supply, fences, roads and erosion control, etc., on Experiment Farms and Stations.

Buildings.—The Architect's report has detailed the work on buildings and on water supply oversighted by his Branch.

In addition, Farm employees under the Managers' supervision did other maintenance of this sort. It included laying concrete floors of sheds at Alstonville, Narrabri, Cowra, Temora and Condobolin; painting of Farm buildings at Cowra, Griffith, Temora and Leeton; repairs and installation of domestic and stock water supply at Alstonville, Glen Innes, Wollongbar, Narara, Seven Hills, Condobolin, Trangie, Temora and Yanco; and maintenance of erosion control structures at Tamworth, Narara and Bathurst. Also, a lot of minor maintenance was done on Farm buildings such as replacement of guttering, floor boards, window glass, etc.

Fencing.—About £5,000 was spent on fencing material for the use of Experiment Farms and Stations. The major fencing work was at Seven Hills, Wollongbar, Tamworth, Glen Innes, Grafton, Trangie, Condobolin, Temora, Yanco, Leeton and Dareton.

Roads.—Road maintenance is a regular feature of Experiment Farm and Station management, requiring supply of gravel and sealing, and purchase or hire of equipment for road forming. Work of this sort was done at Wollongbar, Grafton, Cowra, Condobolin and Griffith. Entrance roads were sealed at Seven Hills, Leeton and Narara, and those at Alstonville and Dareton were re-sealed.

Erosion Control.—Constant attention was given to this. Restorative measures were necessary at Alstonville and Narara following abnormal rains in the late summer. Existing erosion control systems were repaired at Bathurst, Tamworth and Cowra. In orchards in the drier areas, cover crops and straw mulches were used.

Drainage.—Further drainage work was done at Duck Creek Sub-station of Wollongbar Agricultural Research Station, and at Griffith Viticultural Research Station.

Soil Fertility.—Measures to maintain soil fertility were taken at all Experiment Farms and Stations.

Aesthetic.—Further tree planting was done at Condobolin, Cowra, Narrabri, Griffith, Tamworth and Narara. Establishment of lawns at the administrative buildings progressed at Narrabri, Tamworth, Griffith, Dareton, Leeton and Alstonville.

Fodder Production.—The cereal grain harvest was good. It gave enough grain and hay for the 1961-62 needs of Experiment Farms and Stations. Some of the Hawkesbury Agricultural College, Wagga Agricultural College and Glenfield Veterinary Research Station needs were also met. The hay and other roughage and grain stored on Experiment Farms and Stations at 30th June, 1962, were sufficient to meet the immediate fodder needs and to feed for a lengthy drought period. Estimated value of fodder in reserve was £49,435.

One hundred and twenty-seven tons of lucerne and pasture hay and 19,347 bushels of grain were transferred from cereal producing Experiment Farms and Stations to other establishments where fodder conservation is limited by experimental activities, other projects, or climatic conditions. Estimated value of the fodder transferred was £14,478. Arrangements for continued production of fodder requirements of all Experiment Farms were made in the 1962 Autumn.

Seed Production.—The policy of using only standard cereal seed for general cropping purposes at Experiment Farms and Stations was continued. All requisite seed was produced. It amounted to about 3,000 bushels. Of this, 1,600 bushels was transferred to Farms where cereal seed production was not practicable.

Livestock.—Interchange of livestock between Departmental establishments occurred for research work, to relieve stock numbers and thereby reduce fodder consumption, to utilise excessive growth on more favoured farms, and for student rations.

Farm Machinery.—About £25,000 was spent in this direction. Estimates for 1962-63 indicate still a big lag in supply of plant and equipment. The estimates ask for about £73,000, including £52,000 for research equipment.

A big increase in the annual allocation of funds for plant is needed, to replace equipment and keep it reasonably modern, and to fulfil the needs of research.

The Branch gave advice concerning rural mechanisation, agricultural machinery and plant, to the Departments of Local Government, Technical Education, Education, Child Welfare and Social Welfare, Tourist Activities and Immigration, Conservation, Prisons and Public Health; the Aborigines Welfare Board, the Electricity Authority of New South Wales, the University of Sydney, the N.S.W. Milk Board and the University of N.S.W. Advice was also given to Government Stores Department in its decisions on the needs of some other Departments.

Similar advice on rural mechanisation and farm machinery was provided to Commonwealth Departments, overseas Trade Commissioners, representatives of foreign Government Departments, and the Queensland Sugar Cane Board.

Material was supplied to the Australian Broadcasting Commission for broadcasting; and broadcasts were made by the Agricultural Engineer.

Motor Vehicles.—Seven new vehicles were supplied.

The Experiment Farms and Stations Branch has to recommend replacement of old vehicles on Experiment Farms and Stations, and to check and take delivery of all new vehicles supplied to the Department.

Plant Inspectors of the Branch inspected all Departmental vehicles attached to Head Office, to determine any necessary repairs, and inspected vehicles after repair work.

General Equipment, Materials, etc.—Timely supply of general stores and items of minor equipment, and repairs to machinery and purchase of spare parts, were supervised. The value of stores supplied was about £60,000.

Labour.—Allocation of labour, regular and casual for efficient conduct of the Farms and Stations was supervised.

Farm Mechanisation Advisory Service

Development and conduct of an Advisory Service on Farm Mechanisation and Agricultural Machinery is a responsibility of the Experiment Farms and Stations Branch. Progress was made.

Besides increased service by the Agricultural Engineer, through greater public awareness of the service, two Agricultural Machinery Officers have been appointed. One is in the South-Western Region, at Leeton. The other is in the Western Region at Orange.

The Agricultural Engineer in Extension Service.—He helped to establish the Agricultural Machinery Officers in their Regions, and has kept them posted with information for proper conduct of their work.

He also tendered advice to enquirers by correspondence, telephone and personal discussion; and engaged in other extension work through:—

five articles in the *Agricultural Gazette of N.S.W.*,
four Department of Agriculture booklets,
twenty-five press releases,
sessions at nine field days,
sessions at two short-term schools,
talks at nine meetings,
eight radio broadcasts, and
twelve articles for extension journals.

Engineer's Help to Junior Farmer Movement.—The Agricultural Engineer edited a book for the Australian Council of Junior Farmers' Clubs. This will have a 15,000 circulation. In association with the N.S.W. Junior Farmers' Clubs Council he revised the State Championship Tractor Maintenance and Operation Project and he adjudicated in the State Championship Award.

Agricultural Colleges' Curriculum.—The Agricultural Engineer is also revising, in association with College lecturers, the curriculum of the Agricultural Engineering Section of the Agriculture Diploma Courses at Hawkesbury and Wagga Agricultural Colleges. In this subject he examined the students at each College.

New Agricultural Machinery Officers, in Regions.—The Agricultural Machinery Officer at Leeton, Southern Region, was appointed in January, 1962. He has already visited 64 farms in the area, and has dealt with enquiries over a wide range of agricultural implements, irrigation designs, pumps and spray lines, and equipment. He has delivered radio broadcasts, and is committed to a regular, weekly radio programme.

The Agricultural Machinery Officer appointed to Orange, Western Region, will take up duties on 9th July, 1962. Currently he is in four weeks induction training.

Mobile Mechanisation Van.—The van, located at Tamworth, continued to operate in the Northern and North-Western Agricultural Regions. It provides an extension service in farm machinery maintenance. The Machinery Maintenance Officer lectured at farmer meetings, attended 14 field days, and conducted 15 film evenings. He gave advice to 116 farmers and assisted at three short-term schools.

Research in Agricultural Machinery

The Branch does not engage extensively in experimental work; but was responsible for testing agricultural machinery supplied from funds provided by the Commonwealth Government from the Commonwealth Agricultural Machinery Vote, and some items supplied through the Commonwealth Extension Services Grant.

Research in the use of Solar Water Heaters in the North Coast Region was completed. The results have been published.

In association with agronomists from Division of Plant Industry, some research is being conducted to determine machine methods of harvesting sub-tropical legumes; also, to develop machines to harvest pasture plots, and a rotary sod seeding machine.

DIVISION OF PLANT INDUSTRY

General

Staffing for Research and Extension.—Expansion of agronomic research continued. Substantial funds were provided for this purpose by industries. But in most cases the respective research undertaking raised the need for extra trained personnel. Three graduates were recruited for research, and three resigned; so there was no numerical gain in research staff.

An agronomist was appointed for cotton breeding at Narrabri Experiment Farm; one for pasture research at Wollongbar Agricultural Research Station; and one to Yanco Agricultural Research Station for pasture and crop research affecting Coleambally Irrigation Area.

Shortage of trained extension staff to fill District agronomist vacancies continued. Difficulty in recruiting, and serious wastage due to resignations, secondments and retirements each contributed to the shortage.

There are 36 established agronomist Districts. Four Districts are vacant—Bathurst, vacant since March, 1959; Queanbeyan, since July, 1961; Berrigan, since June, 1961; and Wentworth, since December, 1961.

Two District agronomists resigned this year, one to work with the Commonwealth Development Bank and one with the Australian Broadcasting Commission. Another was appointed to a Regional Supervisor position. Thus, three transfers to District positions had to be effected.

Indicative of the extent of staff changes in recent years due to resignations, retirements and secondments, 70 per cent of the current district agronomists average out at only four years' experience of district work.

In-service Training of Agronomists.—In-service training for junior agronomists to fit them for extension work has continued with satisfactory results. They now get excellent field training opportunities to improve their ultimate service to farmers.

That farmers and others associated with primary production are appreciative of the service by District agronomists is shown by the constant demand from rural organisations for appointment of more agronomy staff.

To keep agronomists well informed of agronomy and allied developments, Schools and Conferences were conducted, including Schools on extension methods, farm management, and irrigation.

Extension Activities.—District agronomists were active at not less than 225 field days, with a total attendance of 13,500, and addressed 233 meetings, with a total attendance of 6,400. Their radio broadcasts totalled 666 and they released not less than 623 items for publication. Their monthly Crop Reports, to a total of 400, were used also by journalists for press articles or broadcasts.

Competitions and Shows.—District agronomists co-operated with Agricultural Societies in the conduct of Wheat, Maize, Pasture and Fodder, and Dairy Farm competitions. They also judged at country Shows. The Royal Agricultural Society of N.S.W. conducted Championship competitions, judged by more senior agronomy staff. At the Sydney Royal Show, District Exhibits and Farm Produce Sections were also judged.

Extension by Others.—In a few localities, mainly in the south, farmers have organised Farm Management Clubs; financed by farmers, to employ an Advisory Officer. Each club is providing a local personalised service to a limited number of farmers. The club advisers seek technical advice from the Department and it is freely given.

The University of New England Department of Adult Education, has engineered the formation of the New England Rural Development Association and 60 or more Community Development Committees. The objects are improved production standards and farm living. Theirs is essentially an extension problem, and, to further the objectives, the Association has called upon the Department to assist. The detailed service envisaged by Association members is, however, beyond the resources of the Department.

Commercial organisations concerned with sale of machinery, fertilizers, sprays, oils and other equipment, increasingly provide information and advisory services. In turn, they, too, look to the Department for technical advice.

Regional Research Conferences.—Three Plant Industry Regional Conferences were held; at Yanco Agricultural Research Station, Wollongbar Agricultural Research Station, and Goulburn respectively.

Plant Introductions and Exchanges

Seed of 1,251 plant species were introduced, including 350 pasture species, 615 linseed lines, 136 of maize, and lesser numbers of other crops. Many samples of seed of crops and pasture species were supplied to other countries.

Land Settlement Work

Closer Settlement Schemes have been subject to some criticism from various sources. The personal factor has been the cause of some failures, but there are many successful and financially sound settlers. Moreover there is no shortage of applicants for blocks.

This Department continued to co-operate with the Closer Settlement Advisory Board, Department of Lands; in selection of estates for closer settlement; in assessing agricultural potential; in preparation of topographical surveys, and design of farms.

The following work was undertaken in co-operation with the Closer Settlement Advisory Board:—

Inspection of Estates and type "A" reports to C.S.A.B.	6
Inspection of Estates and type "B" reports to C.S.A.B.	26
Inspection of Estates—Promotion Application reports	9
Acquisition of 9 Estates for closer settlement, providing for	97 farms
War Service Land Settlement Estates—blocks under review for re-allocation	17

Irrigation

Developments.—Further significant expansion occurred in new installations of private plants and extension of existing projects.

Additional farms were made available on Kooba Estate in the Murrumbidgee Irrigation Areas, and in the developing Coleambally Irrigation Area. This Department assisted the Water Conservation and Irrigation Commission in the design of farms in these sub-divisions and gave advice to the new settlers through the South Western Agricultural Region.

Special assistance has been given to the District agronomist at Griffith by transfer of another agronomist to that location, thus enabling high priority attention to the irrigation developments.

District officers, and the special agronomist (irrigation) were under constant demand for information on irrigation and water supply, particularly in the Namoi Valley. In the Macquarie Valley, mainly in the Wellington, Dubbo, Narromine and Warren Sections, there have been many new private irrigation installations. This arises from good progress now being made with the Burrendong Dam.

Irrigation Schools.—Successful irrigation schools for farmers were conducted at Muswellbrook and Lake Cargelligo, organised in collaboration with the Agricultural Bureau and the Regional Extension Services. A Farmers' Residential Irrigation School was held at Yanco Agricultural Research Station.

In-service irrigation training schools for officers of the Division of Plant Industry and Horticulture were continued. An advanced School was held at Yanco, and another has been organised to be held there in July, 1962. With the completion of this series of in-service schools, over 200 officers will have received the irrigation training to enhance their advisory effect in the field.

Irrigation and Allied Committees.—The Department was represented in the following committees (primary Department shown) by the special agronomist (irrigation):—Blowering Dam Investigations Committee (Water Conservation and Irrigation Commission); Assessment Board—Hunter Valley Flood Mitigation Act (Department of Conservation); Development of Irrigation Districts (Water Conservation and Irrigation Commission); Hunter Valley Conservation Trust (Department of Conservation); Kooba (W.S.L.S.) Soldier Settlement (Rural Bank); Water Research Foundation—State and Research sub-committees; and Standards Association of Australia—Spray Irrigation Drafting Committee. Thirty-three meetings and many informal discussions were attended by the special agronomist (irrigation) as a result of membership of those committees.

Farm Water Supplies Act, 1946.—Individual applications for advances in excess of £1,000 are referred to this Department by the Water Conservation and Irrigation Commission, for examination as to the economics and production potential. Sixty-eight new applications were dealt with, and others that were current at the start of this year were finalised. Other cases, where no advance was involved or where it was for less than £1,000, were discussed with the Commission.

Irrigation Literature.—A paper on yields of crops, fruit and vegetables when grown under supplementary irrigation was prepared for the guidance of engineers designing spray irrigation plants.

Two Irrigation Handbooks covering proceedings of officer in-service training schools were compiled from papers used by lecturers. These handbooks were distributed to all field officers of the Divisions of Plant Industry and Horticulture, as a permanent reference.

Irrigation Designs for Experiment Farms and Colleges.—Design assistance for irrigation facilities at Wagga Agricultural College, Tamworth Agricultural Research Station and Alstonville Tropical Fruit Research Station was given to the Water Conservation and Irrigation Commission. An irrigation design was prepared for part of Seven Hills Poultry Research Station, and for the proposed Tobacco Research Station, Ashford.

Fertilizer Trends

Fertilizer usage in New South Wales continued to expand.

Superphosphate.—This, supplying the essential plant nutrients phosphorus and sulphur, is the main fertilizer. Sales by N.S.W. manufacturers have increased as shown in the past four years: 1958-59—270,000 tons; 1959-60—370,000 tons; 1960-61—425,000 tons; 1961-62—400,000 tons. The figure in 1961-62 was below expectations, due in part to seasonal conditions and economic factors. An estimated 60,000 to 70,000 tons is also supplied by Victorian manufacturers, to southern districts, and by Queensland manufacturers to northern districts. Thus, total usage of superphosphate in N.S.W. now exceeds 500,000 tons.

Bulk handling of superphosphate also shows an upward trend:—1959-60—120,000 tons; 1960-61—200,000 tons; 1961-62—215,000 tons. Superphosphate supplied in bulk is used almost exclusively for aerial topdressing.

Other Fertilizers.—Although superphosphate is by far the most important fertilizer, use of nitrogenous and potash fertilizers is also increasing.

An interesting development is the commercial application of anhydrous ammonia (82 per cent.). About 1,000 acres were treated in the Taree district this year, using special equipment. Cost of application at the rate of 60 lb. N. was £5 5s. per acre.

Gypsum as a source of sulphur also has been applied more extensively, in particular to northern pastures. About 20,000 tons were applied.

Gypsum—Application in Irrigation Water.—When dissolved in irrigation water, gypsum acts as a soil conditioner in some of the difficult clay soil types in southern irrigation districts. Co-operative work continued at Deniliquin with the C.S.I.R.O. Division of Soils, testing application of dissolved Gypsum to certain soil types. A clearer picture of the benefits is emerging.

Fodder Conservation

Trends in Fodder Conservation.—Climatic conditions adversely affected landholders' fodder conservation efforts.

On the coast, favourable conditions produced abundant surplus pasture growth. Haymaking was the most favoured method of coping with it, and local contractors were moved to purchase pick-up baler units. Many acres were mown, but a third of the material was destroyed by rain, and another third was rain-affected. Thus quality was well as quantity of the hay was reduced.

Silage-making also got a lot of attention, but the quantity produced was no greater than in the previous year.

Inland, also, haymaking was the popular means of conservation. But unfavourable weather in early spring and showery conditions at hay-harvesting period limited the quantity. A lot of attention was then paid to storage of oat grain. Large quantities were stored on farms and grazing properties. Silage also was stored, but attention to it was less than to grain and hay.

Over the State as a whole, in spite of unfavourable conditions for hay harvesting, reasonable quantities of fodder were stored and on more farms than in previous years.

Pastures and Fodder Literature.—The series of district pasture booklets—based on agronomists' districts—is still very much in demand. Three of these, for Kiama, Parkes, and Tumut districts, are in the process of revision for new editions. A revised edition for Glen Innes district is with the Printer. The manuscript for a pasture booklet for Wentworth district has been prepared and is about to be edited.

In the district fodder booklet series, one for Lismore district has been submitted to the Printer.

The multilith *Stacking Baled Hay* has been reproduced and is in distribution. A multilith *Storage of Grain in Underground Silos,* for intra-Departmental distribution, has been prepared by translation of a report by the Argentine Department of Agriculture. The extension booklet *Making Good Hay* has also been reproduced.

Pastures

General

Increase of Sown Pastures.—In 1958-59 there was a slight downward trend in area sown to improved pastures; a trend that was arrested in 1959-60. In 1960-61 (latest figures available) the area of sown pasture increased by an amount (400,000 acres) akin to that of the earlier 1950's to a total of 9,530,000 acres.

Large areas of older sown pastures, particularly in the south-west, are now being brought back into cultivation. Effect of the lengthy pasture phase is seen in higher yields and higher protein levels of wheat crops grown on old sown pasture land, than of crops on comparable land that has not been under pasture.

Seed Production, of Summer Legumes.—One of the most significant developments this year was establishment of field-scale seed production areas by the Department, for several summer-growing pasture legumes. Among these were *Glycine javanica, Dolichos lablab, Desmodium uncinatum* and *Lotononis bainesii*. These seed areas are a tangible result of the Department's research programme, started less than ten years ago, towards selection of summer-growing legumes suited by the north coast climate. The selected varieties are from the screening of hundreds of species and varieties.

Production of commercial quantities of seed is eagerly awaited by farmers. They have been impressed by the plants in Departmental trials.

The plants are meant to augment the forage supply, in quality and quantity, in the late summer and the autumn. They could markedly influence the economics of north coast dairy and beef production.

Increased Grazing Lucerne Acreage.—The greatest areas of sown pastures are on the tablelands and in the south-west, because of more reliable rainfall and ease of establishment; as with subterranean clover. In other areas, interest in the lucerne for grazing has greatly increased.

Figures for Dubbo district show this trend in that area. In 1951, some 35,000 acres were sown to permanent pasture. By 1961 there were 950,000 acres, of which 700,000 acres are under grazing lucerne.

Increased Fertilizer Use.—Another significant trend is increased pasture use of fertilizers, mainly superphosphate. Between 1955 and 1961 the area under sown pastures increased by about 30 per cent, whilst the quantity of fertilizer used on pastures increased by almost 100 per cent.

Commercial Production of Pasture Seed.—Production of subterranean clover seed was low because of unfavourable spring weather, but production of others was good, *Phalaris* an ryegrass especially.

Extension of Pastures Information.—The increasing role of sown pastures in N.S.W. agriculture is apparent in the fact that the typical District agronomist is occupied on pasture matters for more of his time than is spent on all other crops.

Seventeen articles dealing with pasture research, extension, and seed production, were published in *The Agricultural Gazette of N.S.W.* by officers engaged in pasture research and extension and other articles bearing on pastures were published by officers mainly concerned with other crops.

Pasture Research

Pasture research continued at the various Departmental institutions; and in several areas where research agronomists are located, away from institutions. Some of the work has been in co-operation with Division of Science Services, Division of Animal Industry, and the C.S.I.R.O.

Funds from primary industries and from commercial organisations have helped.

Pasture Species Improvement.—Primary aims have been more suitable species for the north coast, the central and north western slopes, and the drier inland; and suitable perennial grasses to sow in combination with subterranean clover, particularly in southern areas. There, clover dominance remains a problem because of the effect on animal health, and because pure clover pastures tend to become thistle infested.

There is continued evidence that the Kangaroo Valley strain of perennial ryegrass is more persistent than are other strains on the coast, even as far north as Lismore, including other local ecotypes.

There is also evidence that several summer-growing perennial grasses may prove superior to the widespread paspalum, on the coast and in inland irrigation areas. Of these, South African Pigeon grass (*Setaria sphacelata*) has been most tested, but seed production is a problem.

No legume has yet equalled lucerne in the central and north-west, but several grasses show promise. Seed of one, the Bambatsi strain of *Panicum coloratum*, has been produced in commercial quantities in the north-west.

The Mediterranean strains of cocks foot (Brignoles, Currie, Neptune and several unnamed strains) have aroused interest as possible grasses for more favoured areas of the wheat belt. Brignoles seed has been released to seed growers through the Department by the C.S.I.R.O. These strains are unlikely to be as persistent as *Phalaris* but are more readily established, and they provide feed earlier in the autumn.

Stipa hyalina and *Hordeum bulbosum*, perennial winter-growing species, could be complementary to subterranean clover, but each has weed potential because of seed characteristics; grazing areas have been established to examine this point.

Production curve studies, to help select the best pasture and forage crop varieties to meet seasonal gaps in forage availability, are progressing at Leeton, Grafton and Wollongbar. They have indicated that white clover does little for pasture production at temperatures above 80°F. Also, they have underlined shortcomings of paspalum in irrigated summer pastures. However, paspalum has special value in irrigation areas because of its strong sod-forming habit.

Pasture Establishment Research.—Emphasis in recent years has been on the value of light lime dressings to secure clover establishment on relatively acid soils. But there have been significant responses to heavy lime applications to lucerne on the lower north coast. Further work on this is needed.

There has been evidence that very light seeding rates for establishment of pastures may have been overdone, particularly under irrigation and in coastal areas. In these conditions heavier seeding rates can be justified, for rapid build-up of the pasture to maximum production.

At Yanco a special seeding attachment to sow lucerne under a cereal cover crop has been tested. The better micro seedbed for the lucerne seemed a major factor in better establishment. In the 1961-62 season, competition by the cereal crop did not seem a major factor affecting lucerne establishment.

Under dryland conditions at Yanco, lucerne, sown at 2 lb. per acre, depressed *Phalaris* establishment when the latter was sown at a similar rate. At Narrabri, under irrigation, the seeding rate of Phalaris has to be increased to 5 or 6 lb. to obtain a balanced mixture with lucerne. The alternative row method, widely used in some countries, warrants further study here.

Pasture Utilization and Management.—Little work has been done on these major factors, because of the heavy demand the type of investigation makes on land, personnel and financial resources. The availability of finance from various industry funds will increase the activity and a large-scale beef production investigation has been planned for New England Agricultural Research Station.

The rate-of-stocking trial with breeding ewes continued at Cowra. Wool yields per acre for the 1961-62 season closely paralleled those of 1960-61. Yields were 9.2, 16.6, 27.9 and 33.6 lb. at the rate of 1, 2, 3 and 4 ewes per acre, respectively. Lucerne disappeared from the pasture (initially a Wimmera Rye-subterranean clover-lucerne mixture) under continuous grazing at rates over one ewe per acre. So, a new trial has been planned. It provides for controlled grazing. It will also enable the production potential of a Wimmera Rye-subterranean clover pasture, plus a supplementary area of lucerne, to be studied.

The "feed year" research at Wollongbar continued to select the best species and combinations for adequate year-round grazing. Complementary, production curve studies have helped to determine the required proportions of each species, in terms of area, for maximum utilization and minimum wastage.

Pasture agronomists at Leeton have worked with Division of Animal Industry in a beef production trial on irrigated pastures. This trial has utilized two-thirds winter and one-third summer pasture. The stock have shown a small initial winter weight loss, and unsatisfactory gains in late summer and the autumn. Current production curve studies may lead to an improvement on this situation.

Plant Nutrition.—The effect of a five years' pasture phase prior to cereal cropping was studied at Yanco. The results emphasise the problem as well as the value of a lengthy pasture phase in a cereal rotation. Some important effects of the five years' subterranean clover pasture on the subsequent crop were as follow:—

Tiller production and plant weight were greatly increased.

Nitrogen content of young plants was increased by 25 per cent.

Wheat grain yields were increased up to 100 per cent, but increases in oat yields were insignificant.

Bushel weight was reduced, in both wheat and oats.

Grain protein of wheat was almost doubled.

The lengthy pasture phase, in which the pasture received adequate superphosphate, markedly suppressed skeleton weed growth, but the increased fertility led to serious invasion of the pasture by such weeds as thistles and barley grass.

In lucerne research on the coast, poor lucerne growth is now seen as a complex of nematode infestation, faulty nodulation, and deficiencies of molybdenum, boron and sulphur. Boron deficiency seems also to have contributed to poor lucerne growth on the central and southern tablelands.

For satisfactory subterranean clover and vetch growth on the north coast red soils, application of potash has been found essential. Potash deficiency also has been induced by hay-cropping on the northern tablelands. Since potash needs must be watched, a potash survey trial is now in the U.P.S.E.T. series.

Countering of Black Soil Scarab, Inverell.—In species investigations, lucerne and *Sorghum almum* showed most tolerance to scarab grub attack. *Phalaris tuberosa* and *Setaria Porphyrantha* showed promise in nursery conditions. Following good results with Cumino, *Melitotus officinalis,* a reputedly coumarin-free strain of *M. alba* is now under test. Cowpeas and mung beans were promising summer-growing grain legumes. *Dolichos lablab* strains were also of interest for forage and grain.

In nutrition investigations, molybdenum, zinc, boron and sulphur responses were again seen. Burr medic was used as indicator. Sulphur responses varied. Superphosphate at 150 lb. per acre gave a significant 12.5 per cent increase in wheat yield. Whether this was due to phosphorus or sulphur or partly to both is now being investigated. Survey trials have been initiated to clarify the sulphur story.

In pasture management investigations, elimination of sheep from one property, and grazing only by cattle, led to marked improvement of grub damaged pastures.

In a simple unreplicated grazing trial, stocked at 2.4 sheep per acre since August, 1961, and comparing topdressing of 2 cwt. of gypsum per acre with no fertilizer, there has been marked improvement in favour of the topdressed area. Both lots of sheep gained weight normally until December, 1961. From then on, those grazing the unfertilized pasture deteriorated considerably. The area not topdressed closely resembled farmers' pastures in the area; with little *Phalaris* or lucerne available, due to selective grazing, and *Panicum queenslandicum* as principal component. Whereas, in the topdressed area an appreciable quantity of lucerne was available at all times and, because of selective grazing of lucerne, *Phalaris* entered the winter with considerable growth.

That simple trial has suggested that, adequately fertilized, a lucerne-*Phalaris* mixture could be almost a year round pasture; whereas the normal practice of supplementing unfertilized pastures with grazing oats leads to a rapid deterioration of pastures and invasion by mintweed.

In insecticidal trials Parathion granules at ½ lb. of active ingredient per acre continued to give good protection to wheat.

In cultural trials continuous cultivation has resulted in a decrease in grub population, but a subsequent build-up of grubs when the areas were sown down to pasture.

Length of fallow trials showed highest yields from ploughing immediately after harvest, but there has been no grub damage to test any of the treatments so far.

Pasture Research, Western Division.—The main aim has been to introduce more productive species, and species more tolerant to grazing pressure, into pastures of the Western Division. The work has been in co-operation with 23 property holders for several years past. The results have not been of great value. Future research could well comprise more detailed study of the micro-environment in relation to germination and establishment and physiological and ecological studies of potentially valuable species in the area.

The range of soil types is wide. They differ physically and nutritionally. So, there is a complex research problem.

Management of run-off water from local property catchments has provided good grazing in small areas of sown pasture. Further investigations are warranted.

Species of potential value have retained seed viability for long periods under dry soil conditions. Thus, successful establishment from sowing can be expected after a lengthy dry period. Seed-harvesting ants are a problem though.

Trangie Agricultural Research Station studies suggest that sown areas should be grazed very lightly for a long time after establishment. Buffel grass plants grazed only at the end of the grazing season have in three years developed crowns up to 18 inches across, while plants frequently defoliated have stayed very small and tended to die out.

This Station's studies also indicate the value of rest periods in management of native pastures. In areas only lightly grazed for years, *Chloris acicularis* has completely suppressed the spear grasses.

Experiments on Pastures.—Over 500 Uniform Pasture Survey Extension Trials (U.P.S.E.T.) are current, having been harvested or been under observation through the past year, or have been sown during the year.

Pre-packaging of pasture trials was virtually suspended for twelve months. Thus, some of the collection and processing of results from current experiments was overtaken. However, thirteen species trials were prepared in response to particular requests and 55 kits from previous pre-packaging were distributed.

A survey of field officers' needs in the coming year has been completed and will guide the planning for the next phase of U.P.S.E.T.

Summarising and publicising the results from U.P.S.E.T. is one of the main current tasks. In this direction, the Sulphur Institute, Washington, D.C., U.S.A., has granted $5,000 p.a. for two years, to help the compilation, assessment, and publication of results from U.P.S.E.T. and Tia pasture experiments. This grant will provide for employment of an agronomist to assist the pasture agronomists whose time needs release in part for the review of U.P.S.E.T. trials, etc., and publication of results.

Pasture Demonstrations

Fewer new demonstrations were arranged this year, due to reduced allocations from Extension Grant funds. However, the effective demonstrations (24 Dairy Industry Extension Grant, and 15 Agricultural Extension Grant demonstrations) were more than in the previous year. Useful field days on the demonstrations were arranged by District agronomists.

Pasture Seed Certification

Production Statistics.—The weather caused withdrawal, before inspection, of almost 40 per cent of the total area registered for production of certified seed of all species. Subterranean clover withdrawals were heaviest; 60 per cent of the inspected areas were not harvested.

Total production of certified seed showed a marked decline from the previous year's figures. But white clover production increased sharply, and would have been even greater but for excessive summer rains which prevented harvesting in tableland areas. *Phalaris* production was below that of the previous year, but was still the second highest on record.

Production of certified seed for the 1961-62 season was as follows: Subterranean clover, 599 tons; *Phalaris,* 115 tons; Kangaroo Valley ryegrass, 27 tons; N.S.W. Perennial ryegrass, 20 tons; White clover, 4 tons; Barrel Medic 173, 1 ton.

Inspections under Various Acts.—The number of stores inspected increased from 243 in 1960-61 to 355 mainly because a utility truck was used for the two rural itineraries. Road travel permitted many more towns, and stores, to be visited than does train travel.

General improvement in quality of seeds and stock food offered for sale was apparent. The number of samples taken by the inspectors, under the Seeds Act and the grain section of the Stock Foods and Medicines Act, was only 20 compared to 80 last year. Tests of these samples led to eight warnings under the Stock Foods and Medicines Act and seven under the Agricultural Seeds Act. It was not necessary to launch prosecutions.

Country stock and station agents' practice of selling farmers' dressed seed on commission has declined sharply. Most agents now sell only seed obtained from reputable seed firms, or they have purity and germination reports on the lines of seed they have on offer.

At the request of the Mid-Northern County Council, the Council's weeds officer was permitted to exercise the powers of an inspector under the Agricultural Seeds Act.

Seed Testing Laboratory

Samples handled by this Laboratory totalled 2,500, about 500 less than in 1960-61. The difference was partly because of less certified seed produced, and partly because fewer samples were tested for quarantine reasons.

The Seed Testing Laboratory assisted in the training of F.A.O. students who came to Australia because of the International Seed Year.

The Seeds Officer, with the Seed Production Officer and the Principal Agronomist (Pastures), took part in the Commonwealth Conference of Seed Testing Officers.

Weeds

Weed Control Highlights

Weed control work was highlighted by important developments in the control of annual grass weeds in cereals and lucerne. For control of wild oats in wheat, two herbicides (barban and di-allate) were used on a semi-commercial scale for the first time.

Di-allate, applied immediately after sowing, had performed well in last year's trials. This year it was applied to about 2,000 acres of wheat, barley and linseed.

Barban, on the other hand, is applied when the wild oats are in an early growth stage. Control has not been so spectacular. But, as barban is not applied until the extent of infestation is known, it is likely to have more ready farmer-acceptance.

The major weed of rice is barnyard grass. This year, initial commercial application of 3,4-dichloropropionanilide was made on about 200 acres. Farmer results, as well as those from further detailed investigations, were good. Rice yield increases of from 40 per cent to 100 per cent were reported.

Chemical control of annual grasses in maize and broom millet was also adopted far more widely this summer. Atrazine was the herbicide mainly used.

In lucerne, the demonstration of successful 2,2-DPA control of barley grass, one of lucerne's most serious weeds, was followed in the spring of 1961 by farmers' spraying of several thousand acres of lucerne grown for hay.

Co-operation with Other Organisations

With Other Departments.—Close liaison was maintained with Department of Local Government in administration of noxious plant legislation. On recommendation by the Minister for Agriculture, a grant of £40,000 was made to Councils by Department of Local Government. The grant was distributed as follows: Eight County Councils £23,550, 48 Shire Councils £15,300, 10 Municipal Councils £1,150. Many Councils were effectively active in noxious plant control. Many others are either not interested or in any case relatively ineffective. A number of changes in noxious plant declarations were recommended to the Department of Local Government.

Investigations towards control of aquatic weeds continued, with the Electricity Commission and other bodies concerned with water storage.

Advice was given to Departments of Railways, Prisons, and Public Works, the Forestry Commission, and the Postmaster-General's Department.

With Local Organisations.—Liaison was maintained with many Councils—Shires and Counties particularly—in all aspects of weed control, including advice to the Councils, technical advice by Council Officers, and co-operation in displays at country Shows.

With Herbicide Manufacturers.—Appointment of a research officer and a field assistant by Geigy Australasia Pty. Ltd. to work at Hawkesbury Agricultural College has facilitated co-operative research on herbicides. Close liaison was maintained with other herbicide manufacturers in research and advisory work; and there were many herbicide donations for research use.

Geigy Australasia Pty. Ltd. donated a glasshouse, and Agserv Industries Pty. Ltd. donated a preparation shed for the weeds research programme at Hawkesbury.

Special Advisory Activities in Weed Control

A successful school for Councils' Weeds Officers and others concerned with dissemination of weed control methods was held at Tamworth, for personnel in the Northern and North-Western Agricultural Regions. The regular *Agricultural Gazette* section "Talking of Weeds" was maintained. Field days featuring weeds were held in the Northern and Mid-Western Agricultural Regions.

Weeds Research

Serrated Tussock.—Serrated tussock was herbicidally sprayed from the air for the first time in Australia. It was about 150 acres of non-arable infested country in the Rockley and Porter's Retreat areas. Two rates of the chemical 2,2-DPA (10 and 25 lb. per acre), each in two rates of water (4 and 20 gallons per acre) were applied. Low flying was compared with high flying. Liquid and powder form of the herbicide were used. Areas with strong clover growth amongst the tussock and areas with no clover were sprayed. One section was overburnt two months after spraying.

Serrated Tussock Aerially Sprayed for the First Time

This year, for the first time in Australia, this weed has been herbicidally sprayed from the air. A tract of non-arable country in Bathurst district was experimentally sprayed on a lay-out involving various heights, and various concentrations and rates of herbicide.

In other research this year, burning of serrated tussock one month after spraying with 2,2-DPA increased the control effect compared with tussock burnt one month before spraying, or burnt immediately before spraying, or unburnt. This increase in effect was most marked for the spring application of 2,2-DPA, and least marked for the summer or early autumn applications.

Burning one or two months after application of 2,2-DPA was far more effective than was burning four or eight months after spraying. Cutting one month after 2,2-DPA spraying did not increase the effect as much as did burning one month after spraying.

A serrated tussock-subterranean clover association was sprayed in summer with 2,2-DPA. The tussock was completely removed by it, with no damage to the regenerating clover.

A special pamphlet on tussock control was published; 10,000 copies were distributed in Goulburn areas and 5,000 copies in Bathurst areas.

Hawkesbury College Research with Selective Herbicides.—During the year 28 acres was allocated at the College, as a permanent weeds research area. This land has been divided into four to permit adequate rotation of experiments. It is fenced, netted, and spray irrigated. The weeds research glasshouse has been doubled in size, and another glasshouse and a storage shed have been donated by herbicide manufacturers.

Research emphasis has been given to the problem of herbicide residues and movement in soil. The studies, in controlled glasshouse conditions, have yielded important information on residues and their possible effect on subsequent crops.

The weeds research agronomist at Hawkesbury Agricultural College attended the New Zealand Annual Control Conference in July, 1961, and visited New Zealand research centres. Conditions varied greatly from those of N.S.W., as did herbicidal reactions in many ways.

Weeds in Rice.—Trials in the M.I.A. for control of barnyard grass (*Echinochloa* spp.) have shown post-emergent herbicide 3,4-dichloropropionanilide to be effective and economic. The experiments showed that barnyard grass is an extreme competitor with rice; indicated by comparative uptake of nitrogen, and reduced rice tiller and yield. The 3,4-dichloropropionanilide control of barnyard grass increased rice yields by from 40 per cent to 100 per cent. A rate of 4 lb. active ingredient was effective. Effectiveness of lower rates has yet to be proven.

Weeds in Cotton.—Herbicides were tested on cotton at both pre- and early post-emergence stages, at Yanco and Narrabri. In pre-emergence trials, diuron, ametryne, prometryne and propazine showed promise. Post-emergence diuron and N-(3,4-dichlorophenyl) methacrylanide also showed promise, but less than the pre-emergence treatment.

Aquatic Weeds.—These have become more acute in still water, storages for domestic and agricultural use, and cooling-pond systems. In co-operation with the Electricity Commission, the granular forms of various herbicides are on trial at Maitland. In this cooling pond *Vallisneria spiralis* is the main weed. Atrazine, 2,4-D, ureabor, monuron and fenuron have shown most promise.

Comments on Specific Weed Problems

Continued spread of a number of serious noxious plants and the inadequate efforts by many Councils and landholders to control them effectively, particularly in new infestation areas, are matters of serious concern. Among such weeds are:—groundsel bush on the far north coast; serrated tussock on the tablelands and far south coast; St. John's wort, mainly on parts of the tablelands and slopes; Noogoora burr in the far west and south-west; and skeleton weed, particularly in the north west. Intensive campaigns by some Councils are restricting the spread of these plants, but the efforts are nullified by inaction elsewhere or by action less than the essential minimum.

Groundsel Bush (*Baccharis halimifolia*).—Has spread very rapidly in the past three years, particularly on the far north coast. There it is well established on low-lying ground and the hills. It is most prevalent on disused or semi-used areas. Effective control is achieved by 2,4-D. The treatment is not used often enough.

Noogoora Burr (*Xanthium chinense*).—Infestations have built up in the south-west areas; river flood plains and banks. Regular publicity emphasises the serious threat to the wool industry.

Noogoora burr control cost on the Murray-Murrumbidgee systems five years ago, at the outset, would have been a small fraction of the cost now. Further spread is certain, in the absence of effective control.

St. John's Wort (*Hypericum perforatum*).—It is spreading, particularly along the roadsides, on the tablelands, the south-western and central-western slopes, and the central coast. Vigorous control action is being taken in some districts, notably Mid-Western County District and Berrima County District. Infestations in the latter area appear to have been eradicated. So long as isolated infestations are neglected anywhere, and pasture improvement is not adopted more widely as a control, this weed's spread will be a major agricultural pest.

Serrated Tussock (*Nassella trichotoma*).—Further infestations have been found, one near Dundee (the most northerly yet) and another west of Eden. This has emphasised the continuing need for detailed inspections, throughout the tablelands and the south coast and even in districts reputed to be free of the weed. Rapid spread and disastrous effects on many central and southern tableland properties have amply shown the need for vigorous early action.

Another serious aspect of the Serrated Tussock position is that most farmers who fail to control it on arable land owe the failure to not spelling their pastures for one year after sowing. This mistake allows adult and 90 per cent of seedling tussocks to survive. Pasture spelling for a year after sowing has been repeatedly demonstrated as an effective control of tussock seedlings, and many of the adults, in new pastures.

Too many farmers are expecting a cheap aerial spray or other control not involving use of competing plants such as pastures. This is despite repeated announcements that in the absence of good pasture competition, Tussock control is doomed.

Skeleton Weed (*Chondrilla juncea*).—It is spreading in the north-west, including near Inverell, Moree, and Gunnedah. Thirty-eight new occurrences have been reported from Tamworth district. In these areas, strong control action is being taken, mainly by use of 2,3,6-TBA as a soil sterilant. In some adjacent areas, little control effort has been exerted.

Wild Heliotrope (*Heliotropium europaeum*).—Its spread has caused concern, particularly in the south-west. This annual, summer-growing weed of fallow and denuded pasture lands causes serious stock losses. The only available method to reduce the losses is provision of adequate alternate grazing, such as lucerne.

Wheat

Acreage and Production.—Receivals of wheat by the Australian Wheat Board in N.S.W. from the 1961-62 harvest totalled 67,600,000 bushels; compared with 72,610,000 bushels the previous year. Slightly more than a quarter of the total amount was classed as off-grade wheat, a result of the wet harvest. Bulk receivals amounted to 95 per cent of the deliveries.

Adding the quantity of grain delivered to the southern silos on the Victorian Railway system, and grain held back by farmers to satisfy their 1962 sowing and stock feed requirements, the Commonwealth Statistician has estimated the harvest total as 79,000,000 bushels, valued at about £59,000,000, from about 4,300,000 acres sown for grain—a yield average of about 18.4 bushels per acre. If final figures confirm the estimate, the 1961-62 production will have been the fourth highest on record. The highest was 95,226,795 bushels in 1947-48.

Local mills paid a premium, averaging 24.38d., on 3,441,036 bushels. Also, about 3,000,000 bushels commanded a premium from overseas buyers.

F.A.Q.—For 1961-62, two F.A.Q. standards were declared; one for northern wheat at 63¼ lb. per bushel Schopper weight; and one for southern and western wheat, combined, at 61 lb. per bushel. Standards also were set for northern "off-grade" wheat, at 59 lb. per bushel and southern-western "off-grade" wheat, at 57½ lb. per bushel.

The protein percentages of the F.A.Q. (northern 12.4 per cent, and southern-western 11.33 per cent) were relatively high. They maintained the recent years' gradual increase in protein content.

For the first time with F.A.Q. fixing, a chemical test (Hagberg) was done on all individual samples prior to mixing. This was because of sprung and shot grain in most of the wheat. The test made it possible to exclude, from the F.A.Q., certain deliveries known to have excessive enzyme activity due to sprouting.

Handling of this year's harvest was, in fact, a good example of a form of segregation, in the arrangements made for separate receival and marketing of at least six classes of wheat—northern F.A.Q., southern-western F.A.Q., premium wheats, northern "off-grade", southern-western "off-grade", and a small quantity of third grade (50-54 lb. per bushel weight).

Variety Popularities.—Order of popularity for 1960-61 (the latest available figures) remained the same as in 1959-60, but there were changes in acreage percentages sown to individual varieties.

Glenwari, of poor baking quality, was still the leading variety on acreage, but its percentage of area dropped slightly. Bencubbin and Gabo were reduced in area—significantly—but were still in second and third positions.

Significant increases in percentage of area were achieved by Koda, Sabre, and Insignia, and particularly Olympic. Slight increases were shown by Festival and Spica.

On acreage percentages, the leading varieties in New South Wales for the 1960-61 season were Glenwari (20.4 per cent), Bencubbin (10.1 per cent), Gabo (9 per cent), Festival (8.6 per cent), Koda (4.4 per cent), Sabre (4.4 per cent), Olympic (4.2 per cent), Insignia (3.4 per cent), and Spica (3.3 per cent). Those nine varieties accounted for more than two-thirds of the total wheat area.

Winter Wheats Acreage.—This increased again in 1961. The interest is mainly for grazing, and, in some degree, recovery for grain. Expansion has been mainly in the north-west and in the irrigation areas.

Last available statistics (1960-61) indicated that Winglen was grown on 65,000 acres. Windebri, a sister of Winglen, both bred by the Department, was in the variety recommendations for certain zones. These varieties have now largely replaced the only other commercially grown winter wheat—Winter Minflor.

Premium sales of winter wheat from the 1961 harvest totalled 34,141 bushels. The highest average premium (42 pence per bushel) was paid for Winglen. A Winglen entry was awarded the Commonwealth Championship in the grain section at the 1962 Sydney Royal Show.

Durum Wheats Acreage.—Production of the macaroni variety Dural, bred by this Department, was limited in 1961 by seasonal conditions. All marketable grain, apart from seed, commanded a premium from millers—an average of 33 pence per bushel for 29,000 bushels.

Production of Dural has until now been insufficient to satisfy local demand. This year the Australian Wheat Board Chairman indicated a growing market for Durum wheats and a possibility of consistent premiums overseas.

The current Durum breeding programme in northern New South Wales aims to improve straw strength, by introduction of the dwarf straw character, increase grain yield and increase yellow pigmentation of the grain.

Wheat Improvement Programmes

In the South of the State.—This wheat improvement programme is conducted by the Department's Agricultural Research Institute, Wagga. One result is the variety Falcon, bred at Temora Experiment Farm. Because its milling quality was questioned, the variety has remained a second year in "trial" sowings. The Standing Advisory Committee on Wheat made that decision. Large-scale commercial milling and baking tests during the year have confirmed the Department's views on the quality of this variety.

Two backcross lines of Heron, one with resistance to loose smut and the other with resistance to most of the prevailing races of stem rust, were added to yield trials.

In the North of the State.—Acreage sown to the two Gabo backcross varieties, Gamenya and Mengavi, rapidly increased. They are equal or superior in yield to Gabo, have similar baking quality, and when released they were resistant to both stem and leaf rust. However, they were attacked by new strains of leaf rust in their first year of commercial planting, and in the 1961-62 season stem rust new strains which could attack both these varieties were isolated. Fortunately, in yield trials there are now hybrids with resistance to all the known strains of stem rust. These hybrids have been developed by the University of Sydney and the Department's Tamworth Agricultural Research Station.

Wheat Quality Activities

N.S.W. Advisory Committee on Wheat Production and Marketing.—This was formed in 1961 to consider problems arising from the reports of the Commonwealth Production and Marketing Committees, requiring special action by this State. The cereal specialist is a member and Secretary of the New South Wales Committee. The Committee has met frequently to examine all aspects of wheat quality problems. A start has been made on a draft report to the Minister for Agriculture.

Milling and Baking Tests.—Valuable information on new material under field test was obtained. Samples from centres throughout the wheatbelt were tested by the Chemistry Branch, Division of Science Services, for milling and baking quality. Uniform quality testing of promising varieties approaching the recommendation stage was also done by other testing laboratories, for independent assessment of milling and baking quality. In the course of this innovation, large-scale testing of Falcon was done by a number of commercial mills. These in general confirmed the Department's experience with the variety.

Competitions.—Entries in the open wheat class at the 1962 Sydney Royal Show were well above those of recent years. An entry of Festival, bred by this Department, had highest bushel weight and secured best points for bench characters. Best bench variety in the soft wheat class was a sample of the Departmentally bred Heron. In the strong class, Spica, Winglen and Koda were outstanding; and in the medium strong class the best bench sample was a Falcon entry. The Departmentally bred winter wheat, Winglen, was awarded the Commonwealth Championship honours, an award which considers not only bench but milling and baking quality.

Wheat Experiments—Variety Trials

Distribution of Variety Trials.—Promising new wheat varieties were tested on farmers' properties throughout the wheatbelt in 1961. The trials yielded useful data on field performance, yield, and baking quality, of promising crossbreds and named varieties.

In 1961 (1960 figures in brackets) wheat variety trials were conducted with 55 (54) co-operating farmers, under the supervision of 21 District agronomists, testing 29 (28) varieties. Almost all of the trials were randomised/replicated. Detailed wheat variety trials were conducted also on the wheatbelt Experiment Farms.

Variety Performances.—New varieties under test were Gamenya, Mengavi, Kenora, Hopps, Moora, Gala, Windebri, Falcon, and M.U.O. Dirk 48. The season favoured yields, but in many trials the grain was affected by rains at harvest. Damage from disease or frost was slight.

Gamenya, a backcross derivative from Gabo, was again the outstanding early maturing variety in the north. Mengavi, the other Gabo backcross, was inferior to Gamenya but equal to Gabo. Stem rust barely affected yields, but new strains of stem rust occurred able to attack Gamenya and Mengavi. Increase in popularity of these two varieties will depend on rate of spore build-up.

The two winter wheats Winglen and Mindebri yielded comparably, with Winglen slightly superior. This reversed previous experience. It may have been due to the late rains, favouring the later maturing Winglen.

The two new early maturing Queensland varieties, Kenora and Gala, proved inferior to Gamenya and Mengavi. Kenora and Gala were also susceptible to new stem rust races.

In the midseason to late maturing trials, the main varieties of interest in the north were Moora and Hopps. Both are resistant to the older strains of stem rust but susceptible to some new strains. Hopps proved inferior to the recommended varieties Warigo and Eureka. Moora was equal to Eureka and superior to Warigo. A disadvantage of Moora is consistently low bushel weight.

Falcon was sown extensively in midseason maturing trials in central and southern New South Wales. It proved equal to Olympic and better than any other midseason varieties tested. It is liable to suffer frost damage if sown too early.

In central and southern districts Gamenya and Mengavi proved much inferior in yield to the recommended variety Heron. Falcon was superior to Moora. Windebri and Winglen were inferior to Bordan. The present winter wheats seem generally unsuitable for central and southern areas, except in higher rainfall tableland areas.

Soil Fertility and Rotation Experiment.—This experiment was continued at Condobolin Experiment Farm. It has now completed its sixth year; one-half of the first cycle.

Yields on plots sown after long fallow (27.9 bushels per acre) were almost the same as those on medium fallow (27.7 bushels per acre) but were much superior to those after short fallow (22.1 bushels per acre). Protein content of grain was much better for the plots sown after long fallow.

Results over the six-year period do not indicate a definite trend in favour of any particular rotations. Length of fallow appears to be the most influential factor. There is no definite indication of a trend in protein content.

Harvesting the oat plots was difficult. Because of the October rains there was a lot of second growth; then rains and wind at harvest time caused shattering of grain and lodging of straw.

The best grazing results came from lucerne and grazing oats. Comparing the previous experience, a two-year period seemed too short for medic to build up into a good pasture.

Other Rotation Trials.—The trial comparing volunteer and sown pastures and their effect on subsequent wheat yields was continued at Trangie Agricultural Research Station.

A trial to compare the effectiveness of various ways of preparing stubble ground for a seedbed was concluded at Temora Experiment Farm, after running for three years. The highest yields of wheat have been obtained by burning the stubble and then using a disc plough.

Wheat Fertilizer Experiments.—Wheat Uniform Fertilizer Trials (W.U.F.T.) were conducted at twenty-eight centres for information on the response of wheat to various levels of plant nutrients. These experiments were commenced in 1959 and repeated in 1960 and 1961. When the three years' results are completely analysed, the trials will be redesigned to obtain more specific information. The following results were obtained for the 1960 trials:—

Superphosphate: The majority of northern trials showed a positive response to superphosphate. The response was not always statistically significant. In central and southern areas the yield response was much greater and more widespread. Throughout the State, most trials showed a small decrease in grain protein content with increasing rates of superphosphate.

Urea: Most trials showed a response to urea. Most responses were positive, but some were negative. Nearly all trials showed that increasing applications of nitrogen gave slight increases in grain protein.

Potash and minor elements: In the north yield was depressed by application of potash and minor elements. In central and southern areas there was little response. No significant response occurred in grain protein content.

Field Wheat Competitions

Royal Agricultural Society Competitions.—Six Divisional Championships were conducted in 1961 by the R.A.S. The field judging of most local and all championship competitions was carried out by officers of Division of Plant Industry. About 660 crops of high standard were entered, in 71 local competitions. In recent years the numbers have been 700 in 1960, 767 in 1959, and 893 in 1958.

Winning Championship crops were:—Northern Division—Sabre, 44 bushels per acre; Northern Slopes—Gamenya, 50 bushels per acre; Western Division—Eureka, 42 bushels per acre; Central Slopes—Bordan, 55 bushels per acre; Riverina—Bencubbin, 42 bushels per acre; Southern Slopes—Bordan, 49 bushels per acre.

The R.A.S. has now adopted a Departmental recommendation, to restrict all entries in Field Wheat Competitions and Show Grain Classes to varieties recommended by the Standing Advisory Committee on Wheat.

Junior Farmers Wheat and Oat State Championships.—Judging was done by the Wagga District agronomist. Twenty-two wheat and six oat entries were received. Best oat entry was of the departmentally bred Fulmark. It yielded 52 bushels per acre. The best wheat entry was Mengavi. It yielded 51 bushels per acre.

The Junior Farmers Council has now adopted a Departmental recommendation, to restrict all entries in Junior Farmers Wheat competitions to varieties recommended by the Standing Advisory Committee on Wheat.

Wheat Bulk-harvesting has Taken Over

Bulk-harvesting has rapidly increased and is almost complete. Of 67.6 million bushels of New South Wales wheat to the Australian Wheat Board this season only three million bushels was bagged wheat, and most of this was for local premium sales.

Oats

Production and Acreage.—The 1961-62 grain crop has been forecasted as about 18,000,000 bushels, valued at about £6,000,000, from about 925,000 acres harvested for grain, with a yield average of about 19.4 bushels per acre. Total sowing of oats for all purposes (grazing, hay and grain) was estimated at 1,600,000 acres.

For comparison, actual grain production for the previous year (1960-61) was 21,466,000 bushels from 918,000 acres sown for grain (23.4 bushels per acre average), from a sowing of 1,570,000 acres for all purposes. The record year for area sown and grain produced was 1958, when 1,627,000 acres were sown for all purposes and 27,638,000 bushels of grain were harvested.

Variety Popularities.—Oat variety statistics have not been collected since the 1959-60 season. The old established varieties, Belar, Algerian, and Fulghum are slowly being superseded by newer varieties such as Acacia, Orient, Fulmark and Avon.

Distribution of Oat Variety Trials.—Besides detailed oat variety trials at Experiment Farms, farmers' oat variety trials were conducted in 1961 (1960 figures in brackets) with 32 (32) farmers, under the supervision of 22 District agronomists, testing 20 (22) varieties. Most of these farmers' trials were randomised and replicated.

Oat Variety Performances.—Generally, yields were high in the oat variety trials. New varieties tested were Avon, Victorgrain 4, V.R. Burke W4464, and V.R.Bke. F x WF W4477.

The highest yielding varieties were V.R. Burke W4464 and Avon. V.R. Burke W4464 has very strong straw but small grain, and Avon is very resistant to shattering. These characters enabled them to withstand the bad weather at harvest time. Victorgrain 4 performed well overall but was not equal to Avon and V.R. Burke W4464. The dual purpose hybrid V.R. Burke F x WF W4477 has not proved to be outstanding in yield trials and has now been replaced by its sister line W4587.

Cooba, the newly released variety from Temora Experiment Farm continued to outyield Fulghum in both grazing and grain yields and has quite good resistance to smut. It has a long grazing season, but recovers well and is early midseason in maturity. It yields moderately well when sown for grain only. Its main defect is a fairly weak straw. Overall, Cooba is a significant improvement on Fulghum.

Oat Improvement Programme.—Oat improvement work for northern N.S.W. is undertaken at the Glen Innes Agricultural Research Station. The aims are release of disease and frost resistant varieties suitable for grain only, and dual purpose types suitable for grazing with subsequent recovery for grain.

Preliminary yield trials were carried out at Tamworth, Narrabri, Gunnedah, and Grafton, to test the adaptability of newly fixed hybrids in different environments. A spring sown trial was conducted at Kingsland.

The Glen Innes winter was very dry and cold. Good October rains enabled recovery in all trials, but this rain continued for about two months. It caused lodging of straw and shattering of grain. Harvesting was difficult, particularly in trials sown for grain only. Selections were made for straw strength and resistance to shattering.

The Crown Rust nursery at Grafton Experiment Farm was successfully conducted. A good infection of Crown Rust enabled accurate assessment of sown material and some selection for resistance was made in the breeding material.

Two hybrids, V.R.Bke. F x WF W4587 and V.R.Boppy Belar W4606, which proved very promising in Experiment Farm trials have been included in farmers' experiment plots. W 4587 is a midseason variety, i.e. about the maturity of Belar, but superior to Belar in yield and straw strength. W4606 is a late maturing variety with a very high grazing yield and a satisfactory grain recovery. A particular feature of this hybrid is its winter habit.

The southern oat improvement programme is carried out at Temora Experiment Farm. The main item of interest was continued good performance of the newly-named variety Cooba. It outyielded the standard variety, Fulghum, for both grazing and grain. It gives grazing over a long period but is early midseason in maturity. If sown for grain only it gives a moderate yield. It is fairly resistant to smut. Its main defect is its fairly weak straw, but, overall, Cooba is a big improvement on Fulghum.

Rate of Seed and Fertilizer Experiment on Grazing Oats.—This has been carried out for four years. Significant increases in yield have resulted from higher seeding rates and from applications of 1 cwt. sulphate of ammonia per acre. Responses to superphosphate have been variable, dependent on the season.

Barley

Production and Acreage.—It has been estimated that a greater area was sown and that grain production will approach that of the previous year (1960-61) when a record quantity of 4,786,000 bushels was harvested from a record 189,000 acres sown for grain, in a record total of 211,000 acres sown for all purposes.

Interest in barley production in N.S.W. has increased to a remarkable degree since 1951 when only 19,000 acres were sown. Present indications point to a further increase in barley acreage. Requests for information about barley growing are notably increasing.

Barley Variety Trials.—Barley variety trials comparing seven standard varieties were conducted on six farmers' properties in co-operation with six District agronomists. On Experiment Farms, barley was compared with oats and wheat for grazing.

The dry early spring favoured the early maturing varieties and in some cases 2-row varieties were higher yielding than 6-row varieties.

Ablyn was the best yielding feed variety, by a small margin. Maltworthy was better yielding than the standard malting variety Prior, but its malting quality is inferior. The new variety Noyep, an early-maturing selection from Prior, was tested in two trials and was very satisfactory. Noyep should be very useful in the drier areas.

Cereal Rye

Production and Acreage.—The latest available statistics are for the 1960-61 season; when 61,815 bushels of grain were harvested from 4,311 acres, in a total sowing of 12,522 acres for all purposes (including green fodder production). The production was above average for the past 10 years, but well below the 1939-40 season's record of 193,890 bushels of cereal rye from 12,196 acres.

Basic Seed Stocks.—Seed of Weethalle strain, Strain 8, Black Winter, and N.I.A.B. where maintained. Small lots were distributed for yield testing (see Cereal grazing trials).

Winter Cereals' Grazing Trials

Cowra Trial.—A trial at Cowra Experiment Farm compared the grazing yields of the four winter cereals rye, barley, oats, wheat. The varieties were Strain 8 rye, Ablyn barley, Fulghum oats, and Winglen wheat. Five grazings were obtained in the season.

The rye and barley were ready for grazing two weeks before the oats and wheat. Highest total grazing was provided by rye, followed by barley, oats, and wheat in that order. Past experience with this trial has shown that the season has a big differential influence on the various cereals, and in some years the order of total production—from wheat, oats, barley, or rye—may be reversed.

Glen Innes Trials.—The four cereals were also compared in grazing trials at Glen Innes Agricultural Research Station. There the promising new oat crossbred, W4606, gave best production.

Coastal Trials.—In these, wheat, barley and rye yielded less green fodder than the best oat varieties.

Winter Cereals—Pure Seed Production

Registered Seed Growers.—Supplies of pure seed of recommended and promising varieties of wheat, oats, and barley, were maintained by the Department and increased and distributed through Registered Seed growers throughout the State.

The Registered Cereal Seed scheme expanded in 1961. In this year (with 1960 figures in brackets), 124 (116) Registered Seed wheat growers, under supervision of District agronomists, and using Foundation Seed supplied by this Department, undertook seed increase of 24 (20) wheat varieties; 100 (88) Registered Seed oat growers carried out seed increase of 15 (14) oat varieties; and 13 (6) Registered Seed barley growers undertook pure seed production of 5 (5) barley varieties.

Foundation Seed.—The recently amended scheme aims to carry over at Experiment Farms sufficient seed from good years to allow of reduced pure seed sowings in the following year. Thus a smaller area was sown on Experiment Farms for Foundation seed production in 1961. This practice has added stability to the Pure Seed production scheme.

Foundation Cereal Seed sowings at eight Experiment Farms and Stations in 1961 totalled (with 1960 figures in brackets) 70 (153) acres of wheat, 20 (55) acres of oats and 9 (15) acres of barley.

Associated with the pure seed production scheme at Experiment Farms and Stations were the initial selection and preliminary increase of wheat and oats at Temora, of barley at Wagga, and of some oat varieties suitable for northern conditions, at Glen Innes Station.

Maize

Production.—The acreage sown was a little more than in the previous year, but, on the coastal belt, flood and disease reduced the overall State harvest to average.

Crops inland and on the tablelands were favoured by the season. Record yields were harvested in some cases. In the New England areas, the acreage sown to maize was the largest and the crop was the best since World War II.

Retention of maize for use on the farms where it is produced continued its upward trend and only a small percentage of N.S.W. manufacturers' needs were met from this State's crops.

About 90 maize harvesting machines operated. A third of them were of the picker-sheller type.

Hybrid Maize Improvement Programme.—Breeding continued at Grafton Experiment Farm and the Glen Innes Agricultural Research Station.

At Grafton 150 fixed inbred lines were maintained in the in-breeding block and 184 selected lines were inbred to obtain new fixed lines. Four new inbred lines were named and 10 new lines selected for naming.

From tests to determine the combining ability of midseason and late maturing inbreds, useful information was obtained.

At Glen Innes, 16,000 hand pollinations were made on the inbred development area and hand crossing block. Single and double cross trials with early and very early maturing material produced satisfactory results. Seed of some promising lines were produced for use in district trials.

An Australia-wide collection of open pollinated maize varieties was made; 101 varieties and strains were located, and have been stored at Glen Innes for use in the improvement work.

Promising experimental hybrids were tested in N.S.W. and in Queensland. Hybrids developed and released by the N.S.W. Department continued to perform satisfactorily.

The late maturing hybrid G.H.128 bred at Grafton Experiment Farm dominated the acreage of maize sown in N.S.W. coastal areas, and the heavy Queensland demand for seed was evidence of its good performance there. Seed production of G.H.128 was intensified to meet the increasing demands, and 75 per cent of the Hybrid Maize Certified Seed areas were sown with it.

The early maturing hybrid N.E.H.1178wx, with its waxy starch properties, released from the Glen Innes Agricultural Research Station last season, was produced commercially on a limited scale.

The heavy loss of early maturing hybrids through leaf blight (*Helminthosporium turcicum*) during the season emphasised the importance of breeding for resistance to this disease. A co-operative breeding programme between the two breeding centres, Grafton and Glen Innes, was intensified. A backcrossing programme was instigated between blight resistant late maturing lines and susceptible early maturing lines at both places. A large disease nursery was sown at Grafton to score inbreds for resistance. Progress was made with the work at Glen Innes, but flooding seriously affected the work at Grafton.

Late maturing hybrids bred at Grafton Experiment Farm again proved highly resistant to leaf blight and of great value to maize growers in blight susceptible districts.

The programme to develop lines resistant to maize rust (*Puccinia sorghi*) was held in abeyance to enable closer attention to the leaf blight programme.

The Eckhardt conversion to male sterile and fertility restoring forms of 26 inbreds from the late and mid-season maturing group progressed satisfactorily at Grafton. Despite flooding, sufficient crosses were obtained to prevent delay in the programme.

Inbreds 25 and C121 were converted to the male sterile form thereby increasing to six the male sterile inbreds now available.

Failure of the breeding progenies of inbred 23 to shed pollen, and failure of the selected progenies of inbred 25 to breed true for fertility restoration, has delayed the release of these inbreds to seed producers.

Inbred M1, suspected of being a slight partial fertility restorer, proved to be a non-restorer when crossed with Y1 male sterile.

Trials were conducted in three centres to compare the yielding ability of fertility-restored and normal counterparts of experimental hybrids. Trials indicated that both forms of each hybrid appeared to be identical.

Seed of the inbred Y1 male sterile was produced at Grafton, for commercial production of the hybrid G.H.128 in the male sterile form.

At Glen Innes, the final observations on inbreds used in production of N.E.H. 7 were made prior to release for production of seed of this hybrid by the male sterile method.

Maize inbreds used by commercial seed producers were maintained at the Glen Innes Agricultural Research Station and Grafton Experiment Farm. All producer demands for seed of inbreds were satisfied.

Hybrid Maize Seed Certification Scheme.—About 16,500 bushels of seed were produced under the Hybrid Maize Seed Certification Scheme, by 43 growers from 438 acres, compared with 14,601 bushels by 45 growers from 330 acres in the previous season.

Hybrid G.H.128, 285 acres as against 168 acres in the previous season, occupied approximately 70 per cent of the area certified.

The Hybrid Maize Seed Co-operative Ltd. marketing pool for late maturing hybrids functioned well and carry over of seed was negligible.

Hybrid Maize District Trials.—Fifty-four trials for grain production were organised. The Queensland Department again co-operated to test breeding material and hybrids on the Atherton Tablelands. Some of these hybrids and the breeding material provided disease resistance and drew a lot of interest in Queensland.

In the late maturing group, hybrids G.H.128 and G.H.134 bred at Grafton Experiment Farm still performed well, but the general attractiveness, quicker ripening and better stalk strength of the G.H.128 gave it greater appeal in most districts. Some experimental hybrids performed well in the trials.

Hybrid G.M. 211 performed well and its acreage expanded, but it showed more susceptibility to leaf blight than previously. Experimental hybrids now under test are regarded as possible replacements.

Early maturing hybrids, particularly N.E.H.7, remained popular in some districts. Some promising experimental hybrids performed well, and arrangements were made for release of inbred material for commercial seed production of a new hybrid, N.E.H.1066.

Hybrids N.E.H.6 and N.E.H.16 have been in use commercially for about 12 years. This season they were badly affected with leaf blight. Further seed production has not been encouraged.

Very early maturing hybrids developed for inland and short-season tableland climates gave promising yields, but release of a hybrid in this group for commercial production has been deferred.

Hybrids developed by the Shand Selected Seed Company continued to do well in the trials.

Maize Fertiliser Trials.—These were conducted at three Research Stations and demonstrations to show the value of fertiliser in increasing yields were also set up in maize districts.

No conclusive result came from trials where combinations of superphosphate, potash and nitrogen were tested with varying plant spacings.

Molybdenum deficiency investigations with maize were concluded. A report has been prepared by the Chief Chemist. Seed producers on molybdenum deficient soils improved the molybdenum content of their seed to a safe level by use of 1 lb. of sodium molybdate per acre.

Hybrid Popcorn

Seed of the inbreds for the recently released popcorn hybrid N.E.P.37 was produced at the Glen Innes Agricultural Research Station. It was supplied to two growers for production of Certified Seed.

The Blevins Popcorn Company of Illinois, U.S.A., commenced activities here this year.

Hybrid Sweet Corn

There has been more than normal activity with sweet corn because of competition between companies.

Two food processors have been assisted to produce seed of new sweet corn lines.

The hybrid Iochief gained more popularity for canning at the expense of Golden Cross Bantam. A seed shortage resulted. Inbreds for production of the hybrid Iochief were maintained at Yanco Agricultural Research Station but the Department was unable to meet the full demand from producers.

New lines of super sweet Iochief and Golden Cross Bantam have been introduced for improvement work at the Yanco Station.

Grain Sorghum

The north-western acreage expanded and acreage was normal in southern irrigation districts. Record yields were obtained from some crops and the overall harvest was a record.

Hybrids were grown commercially for the first time. The hybrid Texas 610 yielded 75 bushels per acre over two large areas.

About 6,000 acres of Waxy Combine Kafir, a variety made available by the Department in 1958, was grown under contract to Wheat Industries (Aust.) Pty. Ltd. for waxy starch extraction at their Tamworth factory. Canning firms' interest in waxy starch has greatly increased.

Hybrid Grain Sorghum Trials.—The potential of grain sorghum hybrids were tested in eight trials. As a group they yielded higher than the varieties usually grown. The best was Texas 610, with 31 per cent better yield than Caprock and 50 per cent better than Alpha. Texas 610 proved adaptable to a wide range of conditions and showed some drought resistance. The hybrids Texas 620 and Brolga, developed by the Queensland Department, also yielded well.

The hybrids tended to be taller than standard varieties, and to lodge, but growers were not worried by this.

Grain Sorghum Improvement Programme.—Tamworth Agricultural Research Station made good progress on grain sorghum hybrids. Three new male sterile lines were obtained from the Queensland Department. These were seed-increased for production of late maturing hybrids.

Initial crosses were made to form male sterile waxy sorghum lines and several hybrid male sterile lines were pollinated by the variety R7078 to produce three way cross hybrids.

Mother Seed and Foundation Seed for production of the hybrid Texas 610 were produced.

A *Hybrid Grain Sorghum Seed Certification Scheme.*—Rules for this were drawn up. Initial production of 60 acres of hybrid Texas 610 will proceed in Inverell district.

Row Spacing and Plant Population Trial.—This was undertaken at Tamworth Agricultural Research Station, with the variety Alpha. In this favourable season, there was no significant yield difference between row spacing treatments of 7 in., 14 in., 21 in. and 28 in. with uniform plant population of 55,000; and there was no noticeable difference in tillering, height, or weed infestation.

Fodder Sorghum Hybrids

These were available for the first time and created much interest. Seed of a hybrid Sudax was produced by the Shand Selected Seed Company and was made available for commercial growing.

Trials and Improvement Programme.—Trials in a number of districts compared Sudax with other sorghums in common use. They indicated that this new fodder sorghum hybrid has some outstanding features.

Tamworth Agricultural Research Station is working to develop fodder sorghum hybrids and to improve existing fodder sorghums; 30 crosses were made between sweet sorghums and Sudan grasses to evaluate these varieties as parents of fodder hybrids.

Sudan Grass

Trials and Improvement Programme.—The improvement work with S.S.6 sweet Sudan reached final stages of selection. Nine selections were made from 50 lines, and were bulked to give mother seed for production of Certified Seed of S.S.6 sweet Sudan.

Lahoma Sudan continued to compare favourably with S.S.6 sweet in trials and seed production was arranged.

Sweet Sorghum

Sweet sorghum was again valuable in the feeding programme on coastal farms. In inland summer rainfall areas the crop was grown on a large scale for the first time.

Introduction and Trials.—Inland growers' main interest was in the variety Sugardrip. The seed was from Queensland. Good grazing results were reported for it, but other varieties in use and recommended by the N.S.W. Department, for years past, proved superior in trials.

The variety Tracy, introduced from U.S.A., proved its suitability for commercial use. It is now one of the varieties recommended and certified.

Varieties Early Orange and Saccaline gave satisfactory results with producers. Little seed of the variety White African was produced, and the variety lost popularity because of unsatisfactory germination.

Sweet Sorghum Seed Certification.—About 2,500 bushels of Certified Seed of Early Orange, Saccaline and Tracy were produced—100 per cent more than in the previous season. But the Certified Seed produced was less than the State's needs. Growers had to use uncertified seed.

Sorghum Almum

Adoption Trends.—Some areas sown to *Sorghum almum* gave disappointing results. Other areas were outstanding, and the plant is firmly established in several districts. It has proved hardy under extreme dry and cold conditions, but noticeably prefers high fertility soils and soils carrying legumes. It is most concentrated in areas of reasonable summer rainfall or irrigation.

Sorghum almum has been used extensively for conservation as silage. One landowner conserved 1,000 tons in pits this season.

Legume Compatibility.—Trials to test the compatibility of various legumes with *Sorghum almum* continued. In particular, use of cowpeas with *Sorghum almum* for grazing and ensiling has increased.

Seeding Rates.—Investigations again indicated that seeding rates of 2 lb. per acre under dry inland conditions, 4 to 5 lb. under safe summer rainfall conditions, and 8 lb. under irrigation conditions were satisfactory. Row spacing, and manner of seeding, were shown to be less important than the seeding rates.

Strain Observations.—The Crooble strain C.P.I.12019 proved superior to the Nyabing strain under large-scale and varying growth conditions.

Nitrogen Trials.—Use of bag nitrogen on *Sorghum almum* was further tested. Good responses were obtained by use of up to 10 cwt. of sulphate of ammonia per acre; but the economic rate of nitrogen application was not determined.

Yanco Agricultural Research Station trials indicated the optimum economic rate of sulphate of ammonia as possibly within the 4 to 6 cwt. per acre range applied in a single application or in two periods in summer.

Improvement Programme.—Sorghum almum improvement work continued at Grafton Experiment Farm. The source nursery for breeding material supplied several promising types for further testing. Existing plant type selections were evaluated.

Crosses were made between straw glumed selections from the Trangie Agricultural Research Station and plant type selections made at Grafton. Some F1 seed was obtained. Crosses between sweet stalk and plant type selections were unsuccessful.

Sorghum almum Seed Certification Scheme.—There was buyer resistance to Certificated *Sorghum almum* Seed, because large quantities of uncertified seed harvested in Queensland were sold in New South Wales at a low price.

Eight growers registered 435 acres of *Sorghum almum* for Certification. This was about 150 acres less than in the previous season.

Fodder Millets

Improvement Work.—This continued at Tamworth Agricultural Research Station, with special attention to the pearl types.

Seed Increase Work.—First selections have been made from a block of spaced plants. Starr Pearl millet was seed-increased, but leaf diseases appeared and have delayed commercial use of it.

Increased Acreage.—The acreage sown to grain millets increased. Yields were good but prices were only 25 per cent of those in the previous season.

Vetches

Increased Acreage.—Interest in the use of the vetch crop was maintained on the far north coast. It increased in other districts. Most was sodseeded into upland pasture country, and the fodder helped to maintain winter and spring dairy production. Coastal demonstrations were established on the use of vetch. They led to additional sowings.

Seed Production Moves.—Landowners were encouraged to look into production of seed of Golden Tares vetch and commercial seed areas were sown in the Orange, Mudgee and Armidale districts. About 1,360 bushels were produced, from 120 acres, in the initial venture. One grower at Orange had an acre average of 12 bushels, as did a Mudgee grower, from 50 acres.

Two growers, under drier conditions in the south, produced some seed of strains other than Golden Tares.

Improvement Work.—Investigations of strains' disease resistance, grazing, and yielding ability continued at Grafton Experiment Farm and Yanco Agricultural Research Station. *Vicia dasycarpa* has given special promise for certain districts.

Field Peas

Variety Trials.—The variety Dun has proven itself still the best, both for seed production and fodder yield. Valley and Kellerva, particularly the former, were superior to the variety Grey.

Cowpeas

Increased Acreage.—Interest in cowpeas has increased. The acreage sown for seed production expanded, but seed yields disappointed. Poona occupied most of the acreage sown. Areas of the newer varieties Havana, Malabar, Blackeye 5 and Santiago sown for seed production produced limited seed.

Variety Trials.—Yield ability and disease resistance of Havana, Malabar, Blackeye 5 and Santiago were tested at several centres. There were varied fodder and seed yield results from trials at Moree, Narrabri, Tamworth and Grafton. They indicated that some cowpeas might react more to daylight temperature conditions than was previously thought.

Rice

Research Scope.—Rice research was mainly at Yanco Agricultural Research Station into nutrient needs, weed and insect pest control, suncracking, the economics and practical details of aerial sowing, screening and further testing introductions, and subsidiary projects.

Pure Seed.—Yanco Station was also the centre of Pure Seed rice production. The Pure Seed production comprised Caloro II, Calrose, and the Bluebonnet 50 selection, a long-grained variety to meet changing public taste both here and overseas.

Suncracking.—This is still a major unsolved problem. Detailed field surveys and samplings have correlated grain moisture content at harvesting with incidence of cracking. This had led to the present practice of high-moisture harvesting and bulk artificial drying.

No correlation has been found between the protein nitrogen content of the grain and susceptibility.

Solution of the problem may be found in genetics, and the mechanism of suncracking. This approach, further developed in the past season, has been assisted by provision of extra laboratory equipment by the rice industry.

Rice Yields and Industry Trends.—The farmers again achieved record yields; an average of 2.7 tons for the 36,000 acres sown in the Murrumbidgee and adjacent Irrigation Areas. Yields of up to 3.95 tons per acre were recorded in the Murray Valley.

Another feature of the year was the expenditure of a further £70,000 of farmer co-operative monies on facilities for bulk handling and drying rice harvested at high moisture content.

Tobacco

Research Facilities.—Establishment of the Tobacco Research Station has not yet been possible. Nineteen possible sites have been inspected but all have proved unsuitable. Tobacco research continued with headquarters at the Agricultural Research Station, Glen Innes. Increasing use has been made of co-operating farmers. This has been invaluable.

Breeding and Selection Programme.—Further work was done to improve the Department's mould resistant lines and to produce a strain acceptable to manufacturers. Because of the inherent resistance of these lines to blue mould, this work now comprises selection and testing for leaf quality.

Breeding has also been continued, to produce strains resistant to mosaic disease and nematode attacks.

The Plant Breeder is growing two generations of breeding material in the glasshouse in one 12-month period. Results will therefore be obtained much more rapidly.

Agronomy.—District research was conducted by the tobacco research agronomist, now at Ashford. His research includes experiments on growers' properties.

Co-operative work was conducted with the C.S.I.R.O.; three mould resistant lines were tested in district trials sited on five different farms. The preliminary reports on this material were most encouraging. Work to determine details of the tobacco plant's nutrient needs on different soil types has been initiated. Six exploratory fertilizer trials were conducted.

Pathology.—A tobacco plant pathologist was appointed and, after in-service training in Division of Science Services, Rydalmere, he will be located next year at the Agricultural Research Station, Glen Innes.

Study of the Bloodworm Pest in Rice

The floating pan trap has been set in a rice experimental area to capture adult Chironimid midges, as part of a close study of the bloodworm's life cycle and habits. For outcome of the study, see Division of Science Services, Entomology Branch notes, page 85.

Cotton

Research Sites and Scope.—The cotton research is located at Narrabri Experiment Farm and Yanco Agricultural Research Station, with plant breeding at the former and agronomy trials at each. Nutrient needs of the cotton plant, control of insects and weeds, methods and times of irrigation, defoliation methods, and seed treatment are in the programme.

Pure Seed Production.—The programme has been determined and the Department is actively engaged. This is the most pressing work to be done. Commercial seed, obtained by growers from Queensland, is unsatisfactory.

Extension.—The interest of farmers in the north and south and successful cotton growing depend heavily on the outcome of Departmental research and extension of this information. District agronomists in the north and south have been active. Their information and that from growers who are pioneering the crop are interesting many.

In the north, at Wee Waa, an experienced American cotton farmer had a yield average in excess of 2,000 lb. of seed cotton per acre. In the south, at Deniliquin, a farmer growing his first crop had an average of 1,450 lb. per acre over 80 acres; some portions yielded 2,100 lb. per acre. At Robinvale, just across the Victorian border, two farmers grew on an area of 130 acres an average of 1,850 lb. of seed cotton per acre; 100 acres of this crop yielded in excess of 2,000 lb. of seed cotton per acre. The low yield from the rest of the area was due to a limestone hard pan that prevented root penetration.

In spite of their inexperience in cotton growing, southern farmers have had results of outstanding value to the future of what may become a major inland irrigation industry. Some of the credit goes to the Departmental extension officers concerned.

Oil Crops

Linseed.—In 1961-62, the area planted was less than 8,000 acres. Some growers have yield averages of 18 to 20 bushels-acre; comparable, on a price basis, to 45 to 50 bushels per acre of wheat. But most secure little better than 8 bushels-acre. Extension officers have set out to show the profit potential of linseed. Several have established trials.

Safflower.—This plant produces edible and industrial oils. As a source of an edible fat for human nutrition, safflower oil has been popularised in U.S.A. and the acreage has markedly increased in recent years.

Because of this local oil merchants have displayed a great interest and are trying to promote cultivation of this plan. It does well in New South Wales, but the prices offered (£45 per ton f.o.r. Sydney) have been far too low to gain growers' interest. Only 290 acres were sown in N.S.W. in 1961.

Departmental work with safflower has again comprised only some trials sponsored by District agronomists.

Soybeans.—This most valuable oil crop can without doubt be grown and grown well under irrigation in N.S.W. Buyers are interested, but the price offered to growers (£50 per ton f.o.r. Sydney) is far too low for growers' interest.

Some research effort was devoted to irrigated soybeans at Yanco and at Narrabri. Variety and "time of sowing" trials yielded interesting information. At both centres, experiment plots yielded at rates exceeding 40 bushels per acre.

This crop is sure to prove its worth to farmers. Secondary industry wants it because of 20 per cent content of semi-drying oil. After the oil has been extracted, soybeans provide a meal that contains up to 40 per cent of high quality protein suitable for human and animal consumption.

Miscellaneous Plants

Ramie, Oil Poppy, Duboisia, Peanuts, Giant Lily and other crops were given attention designed to provide information if farmer interest now occasionally displayed should develop into something more notable.

Vegetables

General

Promising Lines.—No new vegetable variety was named, but the vegetable improvement programme made good progress. Two potato seedlings proved most promising. Extensive field trials of tomato varieties from Yanco Agricultural

Research Station proved them well suited to the M.I.A. New hybrid tomatoes tested at Hawkesbury Agricultural College also did particularly well in coastal districts.

Influence of Supermarkets.—This is becoming more marked. They provide a greater outlet for processed vegetables and prepackaged lines and they purchase in larger quantities than the usual retailer. As a result, large scale mechanised production is increasing.

Research by Private Organisations.—Two private organisations this year appointed agronomists for research on vegetables. They have sought the Department's co-operation in planning trials and the interpretation of results. This trend offers great possibilities. At Gundagai, research with asparagus and other vegetables will be undertaken in co-operation with the Gundagai Asparagus Company and the Rural Bank; and at *Nericon Farm,* Griffith, soil fertility problems are to be investigated.

Potatoes

Breeding for Improvements.—The breeding programme centred on New England Agricultural Research Station, Glen Innes, continued. About 200 crosses were made for a harvest of more than 600 seed balls. The main female parents included Blanca, Delus, Kennebec, Haig, Onaway, B595-76 and B3429-23, from U.S.A.; local varieties Adina, Awaba, Crana and Bungama; and advanced locally developed selections. The most used male parents were Tawa, Menominee and Katahdin, from U.S.A., and a wide range of advanced local seedlings. The crossing programme involved about 80 seedlings and varieties.

Improvement in quality of first year seedlings mentioned in last year's report continued. Many parental lines have been rejected from the crossing programme. They were replaced by improved locally developed seedlings and new introductions from overseas. Lines such as the United States seedling B595-76 have been widely used because of the high proportion of attractive types in their progenies.

More than 10,000 first year seedlings were grown in the glasshouse. Progenies involving as parents the local seedlings S 2782, S 2856 and S 2864, and the United States varieties B595-76, Delus and B922-6 are quite promising.

From the 5,200 second year seedlings at the substation, 360 selections were made. Lines of particular note were Onaway x S 2856, Monak x 11-79 x Crana, B3095-18 x Adina and B3095-18 x S 2856. Some attractive seedlings were selected from crosses where Walanga was female parent and B2067-52, Merrimack and Redskin were male parents.

From 210 third year seedlings, 88 were selected for next season's fourth year section. B595-76 again showed its good value as a female parent, particularly when combined with local material. Of special note were selections from B595-76 x S 2782 and B595-76 x Adina. The seedling S 2782 is a selection from the cross Smooth Rural x Katahdin.

From 125 fourth year seedlings, 57 were selected. Of seven promising lines selected from S 2864 x Merrimack, four are highly resistant to Late Blight. Other attractive lines were selected from the crosses Kennebec x Katahdin, B595-76 x Adina and B595-76 x Awaba.

A preliminary yield trial of the most promising advanced selections was grown at Red Range. Lines retained for more widespread trials next season included selections from B595-76 x Adina, B24-58 x Katahdin, Crana x Redskin and B595-76 x Katahdin.

Breeding for Disease Resistance.—Of 59 seedlings tested by Biology Branch, Division of Science Services, for resistance to Late Blight, 27 were highly resistant to the Blight races used. Resistance was derived from the United States lines Saco, Kennebec, B595-76 and B922-6, and the Scottish lines 2079 (ab)7 and 1928(e)2.

Four advanced selections from Monak x 11-79 were susceptible to Virus X, but could not be infected with Virus Y. These will be further tested. Eighteen lines resistant to Virus X were selected from crosses where B595-76 was the female parent.

Potato Introductions.—Six new introductions were grown in quarantine at Glen Innes. Fundy and F4724 from Canada each showed promise.

Potato Fertilizer Trials.—Potato Uniform Fertilizer Trials (P.U.F.T.) continued in all major potato districts and 17 new trials were planted. The trials are designed to compare all combinations of 0, 4, 8, 12 cwt. superphosphate, 0, 1, 2, 3, cwt. sulphate of ammonia and 0, 2 cwt. sulphate of potash.

In only one trial, in the Sydney area, did potash increase yield significantly. In the trial at Singleton, potash depressed yield significantly. In all other trials it had no significant effect on yield.

The general trend of results in tableland areas is that 8-12 cwt. of superphosphate, combined with 1-2 cwt. of sulphate of ammonia, will give most economic returns. In most coastal areas the phosphorus requirement does not appear to be so high. Four cwt. apparently is sufficient in many cases, though, in some trials 8 cwt. gave a significant response.

Sulphate of ammonia needs in coastal areas have been indicated as mostly fairly high—3 to 4 cwt.

Potato Seed Certification Scheme.—Due to adverse conditions, the area submitted for certification (1,320 acres) was less than in the previous season (1,527 acres). The number of growers (130) also showed a slight decrease from that of last year (136). Rejections were 16.6 per cent compared to 7.7 per cent for 1960-61. Most rejections were due to withdrawals and waterlogging; disease incidence was low. In the 1960-61 season 40,343 bags were sealed, but for 1961-62 the total is unlikely to exceed 36,000.

District Variety Trials.—In the seed increase area at Orange more than 5 tons of seed was produced for the thirty District variety trials. It was made up of fourteen named varieties (including five from U.S.A.) and twenty-five locally-developed seedlings.

The recently named Bungama continued to do well, particularly in tableland trials. A more recently developed seedling, S 2854, a selection from Sequoia x 11-79 performed very well in all tableland trials. In many cases it outyielded all other varieties and seedlings in the trial and produced better quality tubers. S 2869, a late maturing selection from Monak x 11-79 also showed out very well in all these trials.

In coastal trials, where early maturity is desirable, Bungama yielded well, but was a little too late. Under irrigation, the American variety Katahdin produced well. Most promising of the early maturing Departmental seedlings was S 2860, a blight resistant selection from 835a-4 x Adina. It was outstanding at Robertson, Terranora and Ebor.

Quality Tests.—Comprehensive cooking tests were done by the C.S.I.R.O. on seven Departmental seedlings and the two standard commercial varieties, Sebago and Sequoia. In overall rating of acceptability, the Departmental seedlings S 2854, S 2860 and S 2856 filled the first three places.

Specific gravity determinations were done on seedlings and varieties in as many variety trials as possible. Indications are that specific gravity of seedlings and varieties grown under dryland conditions in tableland districts is higher than when grown under irrigation in coastal or near coastal conditions.

Introduced varieties reputed to be high in specific gravity performed well in these tests. The United States varieties Kennebec, Merrimack, Delus and Saco in particular gave high readings, wherever tested. Local seedlings with high readings under all conditions were S 2854, S 2860 and S 2869.

Tomatoes

Breeding.—College Challenger, named and released in 1960-61, was widely tested by commercial growers. Many reported favourably.

Tests of potential hybrids at Hawkesbury College indicated that Indian River, Anahu and Step 286, from Hawaii, have great possibilities as parents. Hybrids where these varieties were used as one parent and Chinese Red varieties were second parent gave yield increases up to 50 per cent over the heaviest yielding parent. These results were confirmed in trials in coastal districts.

Although the ruling price for hybrid seed is £21 per ounce, compared to 14s. per ounce for ordinary seed, 100 ounces of commercial hybrid seed, sufficient to plant 50 acres of tomatoes, were used in the Murwillumbah district. This indicates the value of research on hybrids.

Advanced generations of the crosses Anahu x Step 286, Kokomo x Rouge de Marmande, and (Kokomo x Rouge de Marmande) x Rouge de Marmande showed promise in yield trials.

At Yanco Agricultural Research Station, observations were made on some 50 acres of Roma, No. 255 and YTMF-7, grown for the Leeton Co-operative Cannery. These three varieties, developed at the Station, were completely resistant to *Fusarium* wilt; whilst this disease caused total loss of some

adjoining areas of the commercial variety KY 1. Roma and YTMF-7 are acceptable for processing, but No. 255 may not be used for canning whole.

In the breeding programme, selections in the F_6 and F_7 generations showing promise for pulp, juice and canning have also shown high resistance to *Fusarium* wilt. These include crosses of Tatura Dwarf Globe with No. 255, M 3, and 160 A; also Bounty x Kokomo and Pan American x Moscow.

Tomato Introductions.—Only six varieties were introduced this year. Of recent overseas varieties the most promising were Indian River and Step 286 from Hawaii, Manapal, Campbell 146, VF 145, Marion and Red Global from U.S.A., Potentate from New Zealand, and Vinequeen from Canada.

Introduction of Male Sterility.—Grosse Lisse seed was treated with radioactive P32 at three different intensities, in an attempt to induce male sterility. Early results indicate that some male sterility has occurred and detection, isolation and testing of mutants continued.

Further trials with the Gametocide FW 450 indicated that though adequate male sterility could be induced, such undesirable effects occurred on treated plants even at low concentrations that cross-pollination could not be successful.

Beans

Performances of New Varieties.—No new variety was named this year, but a fixed line from Fullgreen x Brown Beauty is being listed by seedsmen as Hawkesbury No. 18. This follows good performances in their trial grounds and on growers' properties. Apart from high yield, its resistance to Anthracnose Strain No. 1 is important.

College Pride, named in 1959-60, has now been widely accepted by growers. It seems capable of heavier yields than any other commercial dwarf bean variety. College Supreme and College Early have not been available for extensive commercial production, because seedsmen have had difficulty in increasing seed.

Breeding.—The November, 1961, flood severely affected the breeding programme at Hawkesbury College. Crossing, selection, yield testing and seed production work were nullified and work in the 1962 autumn had mainly to be building up seed stocks of breeding lines.

Eleven new crosses were made, using disease resistant and high-yielding parents and over 100 new selections were made from promising crossbred lines. Evaluation of anthracnose resistance of breeding lines and single plant selections was done in the winter through artificial inoculation.

At Yanco Agricultural Research Station the main improvement aim has been a white seeded stringless variety of concentrated maturity, suitable for processing. Several lines are now genetically fixed, and seed has been increased for yield and canning trials. The lines were from Processor x FM-1, Seminole x FM-1 x Seminole, Slendergreen x FM-1 and Contender x FM-1.

Some selections from advanced generations of the cross FM-1 x St. Louis Perfection have shown good potential as pole beans.

Introductions.—Harvester, from U.S.A., did well at Hawkesbury College and Yanco; Slendergreen, from U.S.A., did well at Yanco; and Greenleaf, a rust resistant variety from the Queensland Department of Agriculture, was promising at the College.

Bean Seed Certification Scheme.—Production of certified French bean seed declined further. This was in part due to an unfavourable season; but, also, growers cannot produce seed at the price merchants are prepared to pay. Further, production has been mechanised in a reliable Queensland district and N.S.W. growers cannot compete with it.

The area submitted for certification was 185 acres, compared with 205 last year. Rejections were heavier. Only 38 acres passed compared with 128 last year. And yields were low. Anthracnose and picking whilst green were main reasons for rejections.

Variety Trials.—In two trials at Anna Bay, Windsor Longpod, College Pride, and College Supreme were best. In the Yanco Agricultural Research Station trial with stringless varieties, Seminole again gave highest yield, followed by Slendergreen and Tenderlong, but Seminole is not popular with processors, because of pod quality and dark seeds.

Fertility Trial.—In the Tweed River district, beans yield poorly on old land. Soil analyses have indicated manganese toxicity, probably induced by repeated acid fertilizers. Lime trials have been set up, to determine whether correction of acidity will overcome the problem.

Lima and Field Bean Investigations.—These continued at New England Agricultural Research Station. The season was adverse. Some seed increase was obtained. At Yanco, testing various times of sowing lima beans, no significant set of pods was obtained from any time of sowing.

Peas

Breeding.—The breeding programme designed to produce early pea varieties, with concentrated maturity and superior canning quality, continued at Hawkesbury College. Thirty-four new selections were made from the promising lines Early Wonder x No. 75 and Early Dwarf x No. 75.

At Yanco Agricultural Research Station, the work was mainly yield determination of the most promising lines. Seven lines from the F_6 generation of Greenfeast x Massey produced an average yield of 4,308 lb. shelled peas per acre; and they matured three or four days earlier that Canner's 75. Five lines from the F_6 of Greenfeast x Clucas Early Dwarf and two lines from the F_7 of Greenfeast x Wando also yielded well, and matured earlier than commercial varieties.

Canning Pea Variety Trial.—At Yanco Agricultural Research Station, Hursthouse again yielded best, with 7,216 lb. shelled peas per acre; followed by Canner's 75 with 6,897 lb.

Canning Peas—Rate of Sowing Trial.—Using the variety L99, the Yanco trial examined the effect of varied plant spacings on yield. Four spacings were compared, ½ in., 1 in., 1½ in. and 2 in. The 1½ in. spacing gave the highest yield, with 5,972 lb. shelled peas per acre, following by the 1 in. spacing, with 5,338 lb.

Rockmelons

Breeding.—Breeding for resistance to both *Fusarium* wilt and powdery mildew continued at Yanco Agricultural Research Station. Hybrids in the F_1 generation of crosses, between the powdery mildew resistant lines introduced last year and commercial lines, showed complete freedom from the disease during a heavy natural epidemic. A line in the F_4 generation of Hales Best P.M.R. x Spartan Rock showed very good resistance to *Fusarium* wilt and slight to moderate resistance to powdery mildew. Two plants within the line showed complete resistance to powdery mildew. Further back crosses were made, of the F_1 generation hybrids to Hales Best P.M.R. 45, to improve fruit quality.

Introductions.—Delta Gold, introduced from United States gave a prolific yield of nicely flavoured fruits with excellent keeping quality. It was affected to only a slight extent by powdery mildew.

Cauliflowers

Breeding.—The breeding programme to produce early, high yielding, disease resistant types continued at Bathurst Experiment Farm. Several new crosses were made; and selections were made from more advanced generations. Promising selections in the F_1 generation were made from the crosses Early Dwarf Snowball x Compinas, Russian 2A x Selandia, and Fricker's Original x Compinas. In the F_2 generation, crosses showing promise were Selandia x Early Snowdrift, Idol x Compinas, and Idol x Early Dwarf Snowball.

Fertilizer Trials.—At Bathurst the yield effects of all combinations of three rates each of sulphate of ammonia, superphosphate, and muriate of potash (with each plot split for application of 14 lb. borax per acre) were compared. The treatments showed very little difference in the growing season.

Introductions.—At Bathurst Experiment Farm, Danish Export No. 7, Idol, Progress and Garant all performed well.

Brussels Sprouts

Breeding.—Commercial varieties and advanced hybrids produced in the improvement programme at Bathurst Experiment Farm were trialled at Yetholme. The F_4 generation of Fillbasket x Catskill did best. A very uniform line, it produces tight good quality sprouts. Promising selections were also made from the F_2 generation of Amager x Catskill.

Cabbages

Variety Trial.—At Bathurst Experiment Farm, Golden Acre AH45, Erstling Pointed, and Danish Ballhead Sirius did well.

Capsicum

Selections.—Selections from Hungarian breeding lines were trialled at Bathurst, Murwillumbah and Griffith. In each trial the yellow selections were better than the green Californian Wonder type, for yield and disease resistance. Further selections within the various lines were made.

Onions

Breeding.—Breeding programmes initiated last year at Hawkesbury College and Bathurst Experiment Farm continued. The aim is a high yielding hybrid, with midseason maturity and good disease resistance. Several crosses were made at Bathurst, using the male sterile lines Excel A and Cal Red, with commercial varieties and some lines received from the Victorian Department of Agriculture.

Carrots

Seed Production Research.—Hitherto, attempts to produce carrot seed in the M.I.A. have been unsuccessful. Any seed produced has had very low germination capacity. This season, routine treatment with a systemic insecticide throughout the growing season vastly increased the yield and enhanced the germination capacity by 25 per cent.

Variety Trial.—In a Bathurst Experiment Farm trial of 12 varieties, the most suitable for processing were Chantenay Red-cored, Chantenay 54, Topweight Processors and Selection 66. Varieties most suitable for bunching were Topcrop, Osborne Park and Market King.

Turnips

Seed Germination Experiments.—Two tests of the effect of superphosphate on germination of swede and turnip seed were made at Grafton Experiment Station. In each trial, germination was depressed by the application of straight superphosphate, and the effect increased with higher rates of application. Lime superphosphate had no such effect.

DIVISION OF HORTICULTURE

Research for the Fruit Industries

Summary of Some Results

(1) Post-harvest fumigation of oranges, a treatment evolved at the Citrus Wastage Laboratory, Gosford, to sterilise eggs and larvae of the Queensland fruit fly has been accepted by New Zealand for entry of the fruit to that country.

(2) A cheap, ammonia gas method to control green mould in oranges has been evolved.

(3) A traypack fibre-board container has proved very satisfactory for peaches.

(4) A bushel case to replace the present banana case has been recommended for gazettal.

(5) Overhead spray irrigation for a range of stone fruit has been successful.

(6) A method to improve the strike of Buck plum cuttings has been evolved.

(7) The strawberry varieties Kendall and Bountiful bred by the Department and the introduced variety Majestic are proving valuable.

(8) For the Department's new cherry varieties Ransom, Rival and Regina, satisfactory pollination varieties have been determined.

(9) *Phylloxera*-resistant grape rootstocks 62.66, Montpellier and 402A have high resistance to rootknot nematode.

(10) Superficial scald of Granny Smith apple, and a similar condition in Packhams Triumph pears, have been controlled with diphenylamine.

(11) A new research procedure for cold storage trials has been evolved.

Research—Citrus Industries

Fruit Fly—Sterilisation.—New Zealand has accepted a post-harvest fumigation treatment that sterilises eggs and larvae of the Queensland fruit fly in oranges. Investigations which resulted in this acceptance were done in the main at the Citrus Wastage Research Laboratory, Gosford, under the direction of the Technical Committee on Fruit Fly Sterilisation Investigation in Citrus. The acceptance removes the quarantine barrier imposed by New Zealand against importation of oranges from areas where fruit fly has been found in the preceding twelve months.

The treatment will also assist interstate trade in oranges where fruit fly quarantine barriers apply, e.g., Tasmania and Victoria.

A two-hour ethylene dibromide fumigation of loose fruit prior to packing is involved. As a result of more recent work, New Zealand approval to fumigate oranges after wrapping and packing is now awaited.

Citrus Mould Wastage.—In trials, promising control of mould wastage in oranges has been obtained by including diphenyl-impregnated sheets in packed timber cases and fibreboard cartons, in lieu of individual fruit wrapping with diphenyl-impregnated wraps.

Control of Mould in Citrus De-greening Chambers.—The value of introducing ammonia gas into ethylene de-greening chambers for control of green mould wastage has been confirmed. A simple method of introducing the ammonia gas into the chamber by heating a concentrated solution of ammonium hydroxide has been shown to be effective.

Orange Variety and Rootstock Trials.—Trials comparing various selections of both Washington Navel and Valencia oranges on different rootstocks were planted at both the Horticultural Research Station, Dareton, and the Yanco Agricultural Research Station in 1959. The trials are irrigated by fixed overhead sprinklers. The trees are now near to cropping. Also in the Yanco trials is a comparison of four different rootstocks for Ellendale mandarin.

Washington Navel Orange Yield and Quality.—More widespread use of superphosphate in M.I.A. citrus orchards has markedly improved fruit quality, and a trial has been set up at Yanco Agricultural Research Station to investigate the relationship between fruit yield and quality. The basic treatments are high and low levels of nitrogen, each with high and low levels of phosphate.

Rootstock for Lemon Replantings.—The increasing difficulty of obtaining new land for lemon growing means that more and more new lemon plantings must be made on old citrus land, with associated *Phytophthora* root-rot and citrus nematode problems. With oranges, trifoliata rootstock overcomes these problems because of its resistance, but unfortunately all old-line Eureka lemon strains carry the scaly-butt virus and this precludes their use on trifoliata. Nucellar Eureka lemons are free of scaly-butt, but a bud union disorder has been noted when the nucellar lines are propagated on trifoliata, and this may limit their productive life.

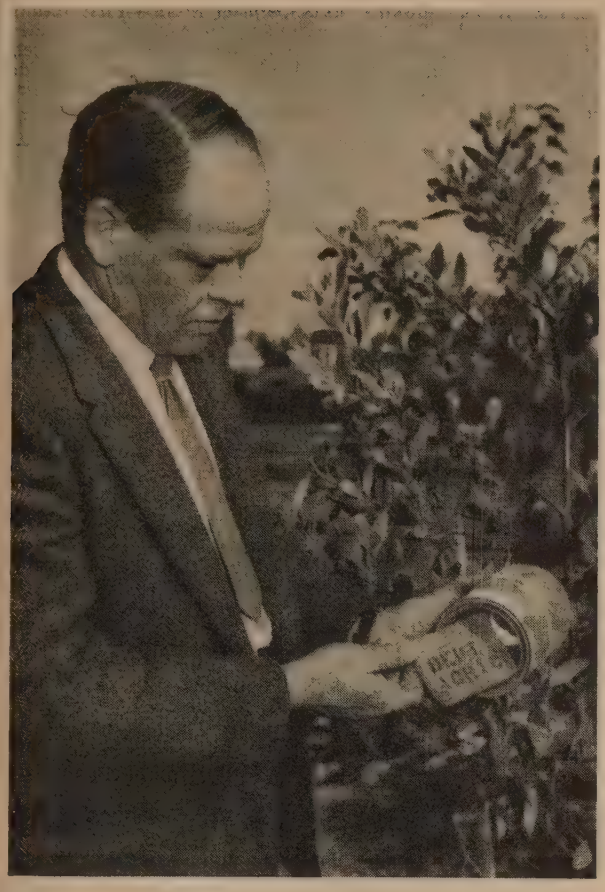
In Spring, 1961, a lemon rootstock trial was planted in old citrus land at the Narara section of the Horticultural Research Station to compare eight different rootstocks for their effectiveness under these conditions.

Strains of Trifoliata Rootstock.—Some fifteen years ago the Department's Citrus Improvement Committee found that trees free of scaly-butt and dwarfing could be grown on trifoliata rootstock provided buds free of these viruses were selected for propagation. As a result, trifoliata has been increasingly used as a citrus rootstock.

Because of the many sources of trifoliata seed in Australia, and since considerable variations in trifoliata strains have been reported overseas, trials were planted at the Horticultural Research Stations at Griffith and Narara. These are to examine possible differences in field performance due to strain variations, and to select superior strains. The trials include Navel and Valencia oranges, mandarins, and grapefruit. So far, any differences between the trifoliata strains selected for trial are not noticeable.

Therapy of Virus-infected Citrus Trees.—With some citrus varieties, all known sources are infected with the scaly-butt virus. So, they cannot be grown successfully on trifoliata rootstock.

An interesting attempt is now being made at the Horticultural Research Station, Narara, to obtain virus-free buds from the infected clones. The method has been to severely cut back trees of the affected variety and obtain buds from the resultant vigorous regrowth. By taking buds right to the tip of the regrowth, it is hoped that the virus will not have developed quickly enough to reach the new growth's extremities and that virus-free budwood will exist at these points. The buds so taken have been propagated on to trifoliata rootstock and will be kept under observation for symptom development of the virus.



State-wide Fruit Fly Survey

The cane-ite pad in the tin trap is impregnated with Willison's lure and malathion. These traps have been widely distributed to record distribution of Queensland fruit fly and intensity of infestation throughout the year. For detail of the fruit fly control projects see Division of Science Services, Entomology Branch, notes on fruit fly—page 86.

Research—Stone Fruit Industries

Fruit Packing Trials.—The tray-pack fibre-board container has proved very satisfactory for peaches over the past two seasons, and in many respects better than wooden cases. A fibre-board case has been recommended for gazettal.

Peach Pruning and Thinning Trials.—Higher yields were produced from Golden Queen peach trees pruned to the "hanger" system than from orthodox or long-lateral systems, in Murrumbidgee Irrigation Area trials. Investigations have indicated a relationship between peach tree vigour and its capacity to mature a crop. This affects the degree of thinning required. Further study of the relationship could reveal a useful way to determine practical thinning.

Spray Irrigation of Stone Fruits.—The suitability of overhead and low trajectory spray irrigation for prunes, apricots and peaches are under test at Yanco Agricultural Research Station. Spray irrigation proved as suitable as furrow irrigation in the first year of trial. This work has an important bearing on the development of new irrigation areas for stone fruit production.

Cherry Rootstocks and Bacterial Canker.—Bacterial canker is a major problem of cherry production. Two resistant rootstocks from overseas, F12/1 and Deister, have been planted out in an extensive series of farmer plot experiments.

Buck Plum Rootstock.—The Buck plum developed by the Department's research programme continued its superiority over all other stocks for European plums and d'Agen prunes. There are indications that it may prove useful for apricots. A three-year research programme has demonstrated a method to improve its propagation by cuttings.

Peach Variety Improvement.—Many new dessert and canning varieties have been introduced from interstate and overseas. Also, some canning varieties bred at Yanco Agricultural Research Station show promise. The varieties Stanford, Gaume, Wight and Windra cling peaches and Halehaven, Fragar, Grays, Glenalton, Late J. H. Hale and Redhaven have become popular. The South African varieties Goosens and Keimos are being tested in district trials. Some twenty new dessert varieties have been introduced for testing.

Cherry Pollination.—Three years' investigation has demonstrated commercial practice for successful pollination of the Department's new cherry varieties, Rons, Regina, Ransom and Rival.

Strawberry Research

Variety Improvement.—This work has been expanded. Sixteen overseas varieties and three Australian selections are under trial. There is also a breeding programme, and a revival of the industry in New South Wales may be brought about.

The varieties Kendall and Bountiful from the Department's breeding programme and the variety Majestic from Queensland are proving of value to local growers.

Research—Grape Industries

Rootstock Trials for Table Grapes.—In 1958 a trial was set up at Orchard Hills to test eight rootstocks for Black Muscat table grapes. During 1961/62, vines on their own roots gave the heaviest yields, 13.5 lb. per vine; followed by vines on 106.8 rootstocks (12.3 lb.) and 101.14 (11.5 lb.). The most popular rootstock (du Lot) in the district, produced only 4.8 lb. per vine.

The best quality fruit came from vines on their own roots, closely followed by those on 101.14 rootstocks. The most vigorous vines, judged by weight of prunings, were those on 62.66 rootstocks (3.4 lb. per vine), followed by 106.8 (2.9 lb.), du Lot (2.6 lb.) and own roots (2.3 lb.).

Phylloxera-resistant Rootstocks.—The new mother vine block at the Yanco Agricultural Research Station is nearing full production. It supplies the majority of cuttings to the Horticultural Research Station, Narara, where the propagation of all grape rootstock has been centralised because of its proximity to the main outlets in the Counties of Cumberland and Camden.

Sales of *Phylloxera*-resistant grape rootstocks for the 1961 planting season amounted to 39,755, compared with 38,040 in 1960. Sufficient rootlings were propagated to satisfy the demand for all varieties. Orders for the 1962 planting season amounted to 39,824.

Fertilizer Trial—Hunter Valley.—Tests of the effect of single heavy and deep applications of potash and superphosphate on Black Shiraz wine grapes were commenced in the winter of 1960. From application rates as high as 6 lb. of potash and 1 lb. of superphosphate per vine, there was no response to the fertilizer in yield, sugar content, pH or titrateable acidity of the fruit, in either the 1960-61 or 1961-62 season.

Treated vines appeared similar to untreated vines and no injury was caused by the heavy fertilizer applications. Leaf and petiole analyses showed a slight increase in potash in treated vines in the 1961-62 season only. Treatment with superphosphate did not increase the level of phosphorus in either season.

Resistance of Grape Rootstocks to Nematodes.—At Griffith, eight *Phylloxera*-resistant grape rootstocks were tested for their resistance to rootknot nematodes (*Meloidogyne incognita acrita*). Rootstocks with a high degree of resistance were 62.66, Montpellier and 420A, in that order. The 106.8 variety showed moderate resistance, while du Lot, 3309, 101.14 and Metallic Cape were very susceptible.

Bunch Stem Die-back of Black Muscat.—Sprays of calcium nitrate and calcium chloride were tested for control of "bunch stem die-back" of Black Muscat. This has been causing substantial Central Tableland and Hunter Valley losses for several years. There was no significant difference in incidence of die-back in treated and untreated vines, but incidence was low in all cases. This might have been the reason for negative results. Calcium chloride sprays caused slight to moderate leaf scalding.

Doradillo Decline.—An experiment to ascertain whether decline in Doradillo wine grapes is associated with its heavy cropping tendencies was commenced at Griffith in 1960. No serious decline has occurred, but vigour and sugar content of the fruit were less as the crop per vine increased. The heaviest yields in terms of fruit and sugar content came from vines pruned to 20 x two-bud spurs.

Improving Strike of Cuttings.—Following the success of indole butyric acid in improving the growth of 106.8 rootlings during 1960-61, the trials were extended to cover more rootstock varieties. Although the rootlings in these trials have yet to be lifted, field observations do not indicate any significant response of any variety to treatment with indole butyric acid.

Wine Grape Quality Investigation.—The Division of Horticulture is assisting the C.S.I.R.O. in a wine grape quality investigation, to define factors causing variation in wine quality made from the same varieties of grapes grown in different districts. The investigation, commenced in 1961, involves the analysis of leaf and fruit samples collected throughout the growing season from plots in the Barossa Valley, Loxton, and Murrumbidgee Irrigation Areas and the Hunter Valley.

Research—Pome Fruit Industries

Rome Beauty Strains.—Three strains of Rome Beauty, each on three rootstocks, NS6, EMXV and Granny Smith seedling, are under test at the New England Agricultural Research Station. The two imported strains Ohio Bright Red and Washington Dark Red are more colourful than the standard Rome Beauty and have proved very valuable. Both are now extensively planted throughout the State. Of the rootstocks, Granny Smith seedling and EMXV are now cropping more heavily than NS6.

Apple Variety Improvement and Introduction.—First from three imported Delicious strains, Starkrimson, Hi Early and Royal Red, have been harvested from trees at New England Agricultural Research Station. Starkrimson fruit is uniformly dark red in colour and the bearing habit would appear to make it ideal for "hedgerow" planting. Two other early varieties, Earliblaze and Starks Earliest, were added to the variety collection from the U.S.A. as well as Richared.

Apple Rootstock Trials.—A trial concerened with intermediate stem pieces for Granny Smith apples has ended, after 23 years. An intermediate stem piece of Northern Spy on seedling rootstock reduced tree size but the trees were larger than those worked directly on Northern Spy. Earliness of cropping was directly related to tree size.

A three-year-old trial of Granny Smiths on Merton Malling rootstocks at Bathurst Experiment Farm has indicated wide differences in vigour and MM102 appears more dwarfing than the standard Northern Spy.

Alternate Cropping of Apples.—Earlier work covering the effects of chemical thinning and nitrogen applications has been terminated. The results are to be prepared for publication.

Gravenstein Twist, Heat Treatment.—Trees propagated from wood of two young trees subjected to heat therapy to control twist were planted at New England Agricultural Research Station in 1961. The trees have made good growth but there are indications of twist.

Bitter Pit in Apples.—Trees at Bathurst Experiment Farm were made available to the C.S.I.R.O. to study movement of radio-active calcium salts in the limbs and fruit.

Pear Breeding.—A selection from the breeding block at Bathurst Experiment Farm BD85/34, shows some promise as a Williams type.

Pear Pruning Trial.—Fruit set and quality were greatly improved by removal of up to 85 per cent. of old spurs on Packhams Triumph pear trees at Bathurst Experiment Farm.

Pear Rootstock Trial.—A rootstock trial set up at Bathurst Experiment Farm in 1939 to test eight rootstocks for Packhams Triumph has ended. The results have been submitted for publication.

Mist Propagation of Cuttings.—Results were satisfactory with peaches, plums and macadamia nuts, but apple and pear results were disappointing.

Fruit Storage Investigations

These investigations are in co-operation with the C.S.I.R.O. Division of Food Preservation at Ryde.

Temperature and Humidity Effects on Storage of Apples, Pears, etc.—This work includes studies of various physiological disorders developed during and after varying periods of cool storage. It has particular reference to low temperature breakdown in Jonathans, internal breakdown in Packhams Triumph pears, and superficial scald of Granny Smith apples. A new research procedure has been worked out. It gives high promise of improved storage trials.

Diphenylamine Control of Superficial Scald.—First results were published. Work is continuing on methods and rates of application, particularly in connection with tray-packs, cell packs, and bulk bins. Diphenylamine has been approved for use in the U.S.A. and New Zealand but not yet in Australia. Similar work is being done with the inhibitor ethoxyquin.

Superficial Scald Control in Packhams Triumph Pears.—This scald has given a lot of trouble in commercial cool stores in recent years. It is much the same type as on apples, and controlled by diphenylamine and ethoxyquin inhibitors or oiled wraps. Two short papers have been published.

Controlled Atmosphere (gas) Storage.—No further work has yet been done, owing to the need to test new facilities acquired when the C.S.I.R.O. laboratories were moved from Homebush to Ryde. Data from the previous six years work have been analysed, and a paper is in preparation on the effects of carbon dioxide and oxygen in relation to superficial scald.

A paper was published on the effect of controlled atmospheres on quality in Granny Smith apples, using the scald inhibitor diphenylamine. This work will be the basis of recommendations to the industry when diphenylamine use is permitted in Australia.

Polythene Bags for Fruit Storage.—This work to date has established that Granny Smith apples retain their original quality better in polythene, provided steps are taken to control scald. Jonathan and Delicious apples proved very subject to low temperature breakdown, but shrivelling and Jonathan spot were well controlled. Storage life of Packhams Triumph and W.B.C. pears is substantially increased by storing in polythene, and the method has largely been adopted by the industry. A paper on the variability of atmospheres produced by fruit stored in these bags has been published.

Research—Tropical Fruits Industries

Bananas—Bushel Case.—Investigation and a recommendation were made regarding a one-bushel case for bananas. A case measuring 18 in. x 13 in. x 9½ in. inside is now recommended.

Bananas—Cardboard Cartons.—In a joint project with the C.S.I.R.O. Committee of Direction (Queensland), the Banana Growers' Federation and the N.S.W. Railways, the marketing of bananas in cardboard cartons is being studied; confined to Sydney marketing.

Bananas—Cercospora Leaf Spot and Speckle.—Experiments for control continued. Oil misting is still effective for the control of *Cerospora* leaf spot. No adverse report has been received. Under N.S.W. conditions *Cercospora* leaf spot and speckle are usually on banana leaves at the same time. To control speckle, a fungicide is needed. An oil plus copper or zineb mist is effective for both diseases. A water plus copper or zineb mist is equally effective and recommended. The water misting rate recommended is six gallons of water per acre. Further experiments are seeking cheaper controls.

Nematode Control.—An isolation block of 400 mother plants was set up at Wollongbar Agricultural Research Station to enable further investigation, and as a nematode-free source of planting material. The suckers of the isolation block were from bunched plants which had been heat treated prior to planting in clean soil.

Weed Control in Established Bananas.—A trial of the efficiency and economy of modern pre-emergence chemicals and knock-down herbicides was set up at the Tropical Fruit Research Station, Alstonville. The investigations will be extended in a new area of bananas in spring, 1962.

Pineapple Selection Programme.—This has been established at the Tropical Fruit Research Station. The first selections were from mother plants from Nambour, Queensland, and were selected for vigour, type, and growth characteristics. Fruit quality of main crop, and size and shape determined final choice; 300 selections have been planted out.

Papaw Line Breeding Programme.—Second generation female seedlings are now available at the Tropical Fruit Research Station, Alstonville. Another group of seedlings of second generation female from Duranbah Plot are now cropping. The strain of female x elongata developed at Duranbah has become mixed and new parents will have to be sought for another programme.

Avocado Propagation Techniques.—Pilot trials, involving use of expendable containers and sterile soil set up on a concrete base, are being initiated at the Tropical Fruit Research Station. The objects are—to reduce risk of *P. cinamomi* infection in the seed-bed; to provide more mobility during grafting; and to reduce shock to the tree at transplanting.

Mango Variety Testing.—Three varieties are ready for planting into the variety block at the Tropical Fruit Research Station, viz. Kensington Pride, Browns Seedling and Banana Mango. Grafting wood of a selection of Indian types, and also of Kensington, are expected in spring, 1962.

Custard Apple Variety Testing.—Trees of, Mosman Seedling and "Kempsey" Custard Apple are ready for planting in the variety block at the Tropical Fruit Research Station. Wood of Pinks Mammoth and Queensland Dwarf are expected in late winter for propagation.

The Research Stations, Experiment Farms and Laboratories

Viticultural Research Station, Griffith.—Following the 1961 underground tile drainage of Griffith Viticultural Research Station (formerly Griffith Viticultural Nursery) preparations were completed for the first experimental plantings. These will be undertaken in the winter and spring of this year.

Projects to be initiated include tile drainage for wine grapes, citrus and peaches and experiments with the pruning, training and spacing of three major wine grape varieties. In addition, preparations have been made for 1962 plantings to provide irrigation investigations on wine grapes, and short-term experimental blocks.

The Fruit Research Officer stationed at Griffith Viticultural Research Station recently completed with First Class Honours a twelve months diploma course in Oenology at Roseworthy Agricultural College, South Australia. This training, including instruction in wine making and viticultural, equips him for wine grape research to be done in the Murrumbidgee Irrigation Areas.

Cool Storage Laboratories—Ryde.—Co-operative investigation continued with the C.S.I.R.O. Division of Food Preservation, Ryde, on the storage, handling and transport of fruits, with particular emphasis on pome fruit. Current studies include storage temperatures, controlled atmosphere storage and polyethylene bag storage in relation to physiological disorders. Study of superficial scald inhibitors has also continued.

Tropical Fruit Research Station, Alstonville.—Difficulties of construction have delayed the installation of an irrigation system. Otherwise, progress has been good. A shade house was erected for work on propagation of Macadamia nuts. A short-term trial block of bananas was established, and a trial of new chemical herbicides for weed control. Selection programmes in pineapples and pawpaws, variety trials in avocado, mango, custard apple and passionfruit, and rootstock trials for avocado were commenced.

Bathurst Experiment Farm.—This is the centre for pome fruit investigations, particularly those for Central Tableland conditions.

A Divisional Conference of all officers concerned with Tableland fruitgrowing was held to plan further development of the Experiment Farm Orchard.

Good progress has been made in writing up the long-standing rootstock trials. Some of these are more than 30 years old.

Particular attention is being given to associated problems of alternate bearing and thinning in apples. Other investigations relate to spray residue removal, pollination of cherries and plums, and mist propagation of cuttings. A new area was developed for an extensive peach variety trial, and two sections containing varieties with different maturity ranges were planted.

Yanco Agricultural Research Station.—This is an important centre of investigation into fruit production under irrigation. A 60-acre orchard includes extensive plantings of stone, citrus and pome fruits. The major programmes include breeding and testing of improved varieties of canning apricots and peaches, irrigation trials with stone fruits, hormone induction of fruit setting in Williams pears, and rootstock trials with citrus and apples. A citrus fertilizer trial, and apricot and pear quality investigations, are also important phases.

Extension of the permanent overhead spray irrigation system continued; to include five acres of established citrus trees concerned with citrus improvement projects, and an additional five acres to be planted in spring, 1962.

Citrus Wastage Research Laboratory, Gosford.—Investigations on citrus wastage control, and on the sterilisation of fruit fly in oranges by post-harvest fumigation, have continued. This Laboratory is operated jointly with the C.S.I.R.O. Division of Food Preservation.

Horticultural Research Station, Dareton (formerly Lower Murray Research Station).—With a small additional planting during the year, to the area of investigation of stem pit virus in grapefruit, over 30 acres are now planted.

Horticultural Research Station, Narara (formerly Citrus Experiment Station, Narara).—New trials, concerned with small sized fruit in Valencia oranges and with stunting in citrus trees, were planted at the Somersby section. A lemon replanting trial was established at the Narara section. A new packing shed and associated equipment, including automatic fruit weighing and counting using photo-electric cells, has been installed at the Somersby section.

New England Agricultural Research Station, Glen Innes.—This orchard has had a period of soil regeneration; preparatory to planting a new series of trials. The first, an apple rootstock trial of the new Merton-Malling series, was planted in 1960-61. It was extended in 1961-62.

Committees Affecting Research

Commonwealth Dried Fruits Processing Committee.—This advisoy Committee comprised representatives of the C.S.I.R.O., Commonwealth Department of Primary Industry, and the Departments of Agriculture of Victoria, South Australia and New South Wales. The Committee deals with all technical aspects of the dried fruits industry, and is reviewing methods to improve the quality of dried vine fruits, particularly the elimination of grit, and sulphuring methods for dried tree fruit. A sub-committee has been appointed to revise the Committee's recommendations on drying and processing tree fruits.

Co-ordination of Research in Fruit and Vegetable Processing.—This Committee comprises representatives of the C.S.I.R.O. Division of Food Preservation and this Department, and two representatives of the canning industry. Matters under attention included the packing of high moisture content prunes, the measurement and influence of pineapple texture on the canned product, and the canned quality of apricots.

N.S.W. Canning Fruits Advisory Committee.—This Committee is made up of representatives of canners and growers, with an officer of the Division of Horticulture as Chairman. It was established by the Canning Fruits Industry to progressively review canning fruit plantings and make recommendations to the industry. It has recommended a target production of 20,000 tons of canning peaches for the Murrumbidgee Irrigation Areas and the trees to achieve this production are already planted.

Australian Canning Convention.—An officer of the Division was in the Secretariat responsible for planning the organisation of the Eleventh Convention, held in Queensland. An officer of the Division presented a paper on world-wide trends in planting and production of canning fruits.

Deciduous Fruit Tree Improvement Committee.—This Committee, comprising officers of the Division of Horticulture and the Biology Branch, Division of Science Services, has the object of controlling the spread of virus diseases in the deciduous orchards of the State and, in particular, to prevent the propagation of infected trees. The Committee's programme for inspection of sources of propagation material for freedom from symptoms of virus diseases was further expanded and now includes 13 fruit tree nurseries. These yield over 90 per cent of the deciduous fruit trees produced in the State.

Advisory Committee on Fruit Cool Storage Investigations in N.S.W.—Representatives of the C.S.I.R.O. Division of Food Preservation, the Botany Department of University of Sydney, and the Division of Horticulture attended the two meetings held this year. General fruit storage and allied chemical investigations are carried out at the C.S.I.R.O. Food Preservation Laboratories, North Ryde; the plant physiology and biochemistry aspects are studied at the University of Sydney; whilst citrus wastage investigations are done at the Citrus Wastage Research Laboratory, Gosford.

Citrus Wastage Research Committee.—This is a sub-committee of the Advisory Committee on Fruit Cool Storage Investigations in N.S.W.; specifically for the Citrus Wastage Research Laboratory, Gosford, operated jointly by this Department and the C.S.I.R.O. Division of Food Preservation. The Committee met twice this year to review progress of the research.

Technical Committee on Fruit Fly Sterilisation in Citrus.—This Committee, comprising representatives of the Commonwealth Department of Primary Industry, the C.S.I.R.O., and the State Departments of Agriculture in Victoria, South Australia and New South Wales, met to complete recommendations on the design, official testing and routine operation of

commercial fumigation chambers. This followed New Zealand acceptance of the sterilisation treatment of oranges from fruit fly areas.

Citrus Improvement Committee.—This intra-Departmental Committee met twice, to direct investigations of effects of virus and soil-borne root pathogens on behaviour and productivity of citrus.

Murray Citrus Sub-committee.—This is a sub-committee of the Commonwealth Committee for Co-ordination of Fruit and Vegetable Storage Research. It co-ordinates investigations into handling, storage and associated marketing problems of citrus fruits from the Murray River areas. The meeting held this year was attended by South Australian, Victorian and N.S.W. representatives.

Extension Activities for Fruit Industries

A particularly active extension programme was maintained, with new recommendations being made in the cultural, marketing and plant protection fields. Matters receiving special attention include:—

In the Citrus Industry.—Extensive work has progressed in citrus areas for construction of chambers and application of the fumigation method to inhibit fruit fly in harvested fruit. Citrus renovation, lemon pruning, citrus nutrition, citrus rootstocks and black spot control have been subject of field days and demonstrations.

Citrus Bud Selection as an essential has been emphasised. Bulk Handling to lower marketing costs has been subject of demonstrations and talks. Citrus Fruit Processing, involving washing, sterilising, rinsing, waxing and drying, to reduce wastage by mould, to increase the "shelf life" and to enhance appearance, has been subject of many talks and discussions, operational instruction and demonstration.

In the Pome and Stone Fruit Industries.—Improvement of fruit quality, improvement and standardisation of presentation for market, development of a better understanding of the newer method of apple and pear black spot control, and pruning techniques have been some of the features.

In regard to "presentation for market" a six weeks school to train packers was held at Orange during March and April, 1962, mostly at night sessions, and a total of 111 adults and younger people were given sound practical instruction there. The night sessions were followed up by instruction on the various orchards during the day. It is of interest that many of these pupils, with no prior knowledge of packing, secured jobs on commercial orchards at the completion of their tuition. Many of them are now packing 80 or more cases per day.

A noteworthy extension item in the Murrumbidgee Irrigation Areas has been pear pruning. Since the introduction, in 1959, of modified pruning methods in relation to W.B.C. pears, the average per tree has increased from 1.7 to 2.5 packed cases.

Most nurserymen are now participating in the parent tree inspection scheme introduced by the Department's Deciduous Fruit Tree Improvement Committee. Great benefit will continue to accrue to the fruit industry from this service. Most trees in future will be propagated from the selected sources, inspected and approved by the Department of Agriculture.

Arising from the introductions of promising types of stone fruits, district plots throughout the main producing areas are providing useful demonstrations of the commercial values under various climatic and cultural conditions. A number of new, well tested varieties of peaches have been subject of planting recommendations.

In the Viticultural Industry.—The extension programme included a campaign on the dangers of applying hormone type weedkillers near vineyards, orchards and market gardens; a campaign against the marketing of immature table grapes; and assistance to firms expanding wine grape production, particularly in the Hunter Valley. In respect of the latter, large areas of land have been inspected to determine suitability for planting; and advisory help has been given to a group intending to set up a modern winery in the M.I.A. mainly for table wines, for which demand is increasing.

Fruit Packing.—The Fruit Packing Instructor has made throughout the State a special effort to uplift the standard of fruit presentation for market by improved grading and packing methods. Twenty-eight organised demonstrations and field days were held, in the various fruit-growing areas, with good attendances. A lot of individual instruction has been given in areas where organised demonstrations were not staged. All field officers, fruitgrowing organisations and the trade have given strong support to the packing instruction campaign. Earlier mention has been made of the special six weeks course at Orange.

Alternative containers in the shape of fibreboard cartons of various types, as against the traditional wooden case, have been subject of special attention.

Publications and Press Statements.—Three citrus publications were revised and two more are under revision. An improved version of the orange packing chart has been produced.

A vine-spraying chart has been prepared, specifically for growers in the M.I.A. The chart suits attachment to packing shed or machinery shed walls. It carries the latest recommendations for pest and disease control in vineyards.

Extensive use of the press and radio, has been made by fruit officers throughout the State. This has been a big help to the various campaigns.

Fruit Officer Conferences.—A conference of fruit officers was held at Hawkesbury Agricultural College in July, 1961, and a conference of fruit inspectors, including certain fruit officers in charge of regulatory staff, was held during May, 1962. Each conference enabled Divisional policy concerning research, extension and regulatory matters to be conveyed as a step in the extension process, and yielded a lot of information, by exchange, for general guidance of all officers.

Fruit Industry Trends

Citrus Industry Trends

Processing.—Packing house processes to improve appearance, reduce mould infection and increase the shelf life are now accepted as necessary for fresh fruit marketing. Most of the co-operative packing houses have installed the necessary plant and many of the larger private growers have done likewise.

Fruit Stamping.—This means of identifying fruit from particular localities is increasing as a result of competitive pressure in local markets.

Bulk Handling.—This, in the orchard to packing house phase of marketing, has developed further during the year. Most packing houses in inland districts have adopted bulk handling in one or other of its forms. Coastal packing house organisations have taken steps towards it. It offers fruit handling economies by eliminating the large numbers of lug boxes previously used with high labour and maintenance requirements.

Juice Processing.—This has grown, stimulated by frozen concentrate packaging by a large company with headquarters in Melbourne. About 6,000 tons of oranges were utilised for the frozen concentrate.

Fixed Overhead Spray Irrigation.—Grower interest has steadily increased, but far fewer new installations were made than in recent years. This was because of the financial condition of the industry through lower prices for fruit.

Supplementary Irrigation.—It held position as a need for citrus growing in high rainfall districts, but expansion has been restricted by financial stringency in the industry.

Export.—Interest in export revived under the stimulus of large crops and low prices on local markets. Successful shipments were made to Far Eastern and European ports. To reduce export costs, trial shipments were made of the 4/5th bushel carton container as against the standard one-bushel wooden box. "Pulled" fruit, as against "clipped" fruit as normally required for export, was also tried.

Reduced Citrus Plantings in near-Sydney Districts.—The reduction continued, under the pressures of urban encroachment and accompanying high land values. It is most evident in the Hills district north of Parramatta and fringing the Metropolitan Area of Sydney, but quite evident in the Gosford district because of the adjacent coastal resorts, beaches, and other housing development attractions.

Elsewhere, citrus planting is sufficient for an overall State increase.

Bulk-binning of Citrus from Trees to Packing Shed

Cutting down on cases and handling costs, bulk-binning from the trees to the packing place has captured attention throughout the citrus industry as in the pome fruit industry. It is destined to be a major factor in orchard economy.

Wine and Wine Grapes Industry Trends

Production Increases.—About 35,000 tons of wine grapes were produced in N.S.W. this year, compared with 25,535 tons in 1960-61. It will be a State record. The M.I.A. produced 31,318 tons, a record for the district, compared with 21,668 tons in 1960-61. In addition to local M.I.A. production, 4,896 tons, mainly the Gordo Blanco and Sultana varieties, were produced in the Murray irrigation districts and processed by M.I.A. wineries, compared with 5,892 tons in 1960-61.

Excellent weather prevailed throughout the growing and vintage periods in the M.I.A. In the Hunter Valley, hailstorms caused severe damage to some vineyards. This, and losses due to downy mildew and ripe rots encouraged by the season, will reduce yields there by a third.

Wine production in N.S.W. for the 1961 vintage was 5,343,721 gallons, about 6,994,000 gallons were produced this year.

Wine Grape Price Trends.—Wine grape prices in the M.I.A. were increased for the main varieties by 10s. per ton over those of 1960-61. The prices of minor varieties did not increase. Satisfactory prices, associated with high yields, gave growers their highest returns ever. Returns per acre averaged £189, compared with £138 in 1960-61 and £106 in 1959-60. This is certain to encourage further expansion of plantings in the M.I.A.

Record M.I.A. Vintage.—This was not due to a larger area of vines. There has been appreciable replanting in the last few years, but most of these vines are not yet bearing. Production per bearing acre in 1961-62 was 8.0 tons, compared with 5.7 tons in 1960-61 and 4.7 in 1959-60. While favourable seasonal conditions were mainly responsible for the higher yields, the effect of underground tile drainage in improving plantings has been significant and above average yields can be expected in the future.

Improved Wine Quality.—Improvement in the overall quality of wines made in N.S.W. has continued. This is due to better production methods, and installation of modern plant, especially in the M.I.A. Wines of outstanding quality are being produced there by some firms.

Table Grape Industry Trends

Production Volume.—Production in 1961-62 was about 5,500 tons, compared with 5,570 tons in 1960-61. This is despite a very unfavourable coastal season where yields were halved by the weather. Higher yields in the irrigation districts would compensate, in the State total, for the above losses. The M.I.A. produced 294,515 half-bushel cases up to 31st May, 1962, compared with 223,487 in 1960-61. Quality of M.I.A. fruit was satisfactory.

Price Trends.—Prices for table grapes from irrigation districts were reasonable. They averaged around 16s. per half bushel case, except for sultanas. These were lower. Through unfavourable weather and poorer quality, prices for early coastal fruit were reduced by about a third compared with the previous year, to around 22s. per half bushel case.

Loss of Chipping Norton Vineyards.—The expanded soil extraction industry at Chipping Norton is to reduce the acreage of vineyards there by almost 200 acres. This district has produced some of the earliest and best quality table grapes in the State. It seems likely that remaining growers in the district will succeed in applications to rezone their properties, due to production difficulties.

Dried Grapes Industry Trends

Production Volume.—Record production of dried vine fruits is expected. It should exceed 13,000 tons, compared with 11,758 tons in 1960-61 and 8,046 in 1959-60. Quality of sultanas and raisins is good. Currants were the only variety to be affected by the early rains and only about half the crop was obtained.

Diversion of Drying Grapes.—Diversion of drying grapes to the wineries and fresh fruit markets continued to be a significant trend. However, due to better drying conditions, less was diverted than in 1960-61. The demand by wineries for drying varieties is expected to decline next year, because of the big wine grape production and the large stocks of wine.

Expansion and Markets.—Plantings of drying grapes are steadily increasing despite uncertainties as to overseas markets. The expansion is mostly in new, private irrigation schemes. Last season's fruit has been disposed of at satisfactory prices,

but expanding world production and the possibility of Britain joining the European Economic Community could confront the industry with great problems.

Tropical Fruits Industry Trends

Banana Acreage Declining.—The decrease of area and number of growers noted last year continued with 451 acres and 280 growers less than in 1960-61. Low average returns is the cause. The planting of 1,806 acres was higher than in 1960-61. This reflects the trend to replace low-yielding old areas with younger, more vigorous high-producing plantations. The Williams variety continued to gain favour and 84 per cent of the total area in N.S.W. is now this variety.

Production Volume Increasing.—Cultural methods continued to improve. This factor is enough to offset the reduction in acreage which has taken place since 1954-55. At that time the acreage was 30,144, compared with the 1961-62 acreage of 28,489. Production has increased from 2,125,781 cases in 1954-55 to 3,072,310 in 1961-62.

Marketing Problems.—Banana growers are increasingly conscious of their marketing problems, and dissatisfied with present methods and returns. Such marketing aspects as cardboard cartons, bushel cases, waxing fruit, processed bananas, export to overseas, and marketing in wire crates have taken an added interest.

When good spring and summer rains caused heavy production in January, February and March, 1962, prices were very low and many growers did not send all of the fruit which matured. The Banana Growers' Federation asked that supplies to all markets be restricted by growers voluntarily. Almost a million cases of bananas were marketed in January, February and March, 1962.

Pome Fruit Industry Trends

Production Increasing.—Apple and pear production in N.S.W. has steadily increased annually in recent years. For the years 1957 to 1961 it has been as follows:—

Year	Apples (cases)	Pears (cases)
1956-57	1,345,259	379,561
1957-58	1,666,923	472,631
1958-59	1,862,473	496,976
1959-60	2,261,115	603,269
1960-61	2,385,927	621,047

Estimated production for the 1961-62 season is 2,468,000 cases of apples and 560,000 of pears.

Since almost 5,000 acres of apples and pears already planted have yet to come into effective production, the increase trend will obviously continue for some years.

Apple and Pear Acreages.—The areas under apples and pears in N.S.W. at the present time are as follow:—

Age of Trees	Apples	Pears
1-5 years	2,573	357
6-10 years	1,830	184
Over 16 years	11,595	3,134
	15,998	3,675

Most of the older trees, and almost all the young trees, are in the areas ideal for pome fruits by reason of soil and climate, and the percentage of young trees in the total plantings is far more than enough to compensate for any normal wastage amongst the older plantings, especially since such wastage will occur mainly in the marginal, low-production areas. Planting is continuing, but at a reduced rate.

Officers in pome fruit areas are at opportune times giving publicity to the production and acreage figures. It is an important issue. The pome fruit industry in all States is showing greatly increased production.

Export trade is a stabilising influence at present but its future is something of an unknown quantity. The present favourable position may not persist.

"Hedgerow" Planting Trend.—All pome fruit planting in the past was on the "square", "triangle", or "contour", the trees 20 feet to 24 feet apart, depending on location. In the recent three years there has been a lot of interest in "hedgerow" planting, the trees 8 feet to 12 feet apart in the rows and 20 feet to 22 feet between rows. There have been plantings in this way in the Forbes district and the upper areas of Batlow, Orange and the New England. Many future plantings are likely to follow this trend.

Most New Plantings in Ideal Districts.—During the past 12 to 14 years, over 90 per cent of all new plantings have been in six or seven of the districts most ideal for pome fruit. It is a reason for the marked improvement in production, and is the most desirable of all trends in the industry.

High Coloured "Sports" Favoured.—In all new plantings there has been a distinct preference for highly coloured "sports" of standard varieties.

Semi-dwarf Rootstock Trend.—With the interest in hedgerow planting, there has been reversion to use of semi-dwarf rootstock, namely "Northern Spy". In many instances, trees propagated on seedling stocks grow too large for handling in the current economy. Smaller trees and more trees per acre offer some relief from the high cost of orchard operations.

During the past 25 years the general use of seedling rootstocks by nurserymen completely eliminated Northern Spy stool-beds in N.S.W. Steps were taken several years ago to supply selected pome fruit nurserymen with small numbers of selected Spy trees as the nucleus for new stool-beds, but they still cannot meet the demand for trees propagated on Spy roots.

There are indications that one or two of the Malling-Merton series of rootstocks at present under trial may be as good as if not better than Spy for close planting purposes.

Increased Cool Storage Space.—In 1950 storage space for fruit amounted to about 600,000 cases, but since then growers have been erecting orchard stores of various capacities according to their needs. This trend has gained impetus each year. Now storage space in N.S.W. is about 1,600,000 cases. Most of the increase has been as orchard stores in the main highland districts.

With space for about half the N.S.W. crop, it should in theory be easy to regulate the flow of fruit to market, and thus avoid gluts and improve returns. However, many growers do not appreciate how much the conditions have changed in this decade. There has been a tendency to hold too much fruit too long. Thus, quantities of over-stored fruit have appeared on the markets towards the end of the year.

Lighter Pruning.—The favourable outcome of lighter pruning of W.B.C. pears in the M.I.A. has already been mentioned. Much the same has followed virtual elimination of old style "detail" pruning in all other districts, with apples and pears. This aspect of pome fruit culture has been subject of a lot of extension activity in all pome fruit areas. It is another important factor in the consistency of crop improvement in recent years.

Bulk Handling Extended.—Bulk handling has been given a lot of publicity in all the main areas, and adoption is extending each year. The greatest impact is in the Orange district. There, some 18 growers with an aggregate of about 700 acres are using one or other of the various bulk handling methods. But in all districts there are growers who have changed over, and some very good systems are in operation.

At Batlow, the Central Packing House arranged to handle the bulk of the district crop this way this season, but the disastrous packing house fire in February, 1962, upset the programme. Even so, much of the crop was bulk handled.

Practically all cool stores built in the past two years, and those projected, have been designed for use of bulk handling equipment. Clearly, most of the N.S.W. crop will be bulk handled soon.

Week-end Orcharding.—This development, increasing in recent years, is not in the best interests of the industry. Around Sydney, there has always been a trend for businessmen to own and farm a small area of land, and fruitgrowing seems to have had most appeal. Now, fruit officers report that the trend is developing around several inland towns.

Export from N.S.W.—The apple and pear export from N.S.W. in the past season has been a record for recent years. Shippers were aware early that the European crop was light and more persuasion than usual was put to N.S.W. growers to sell for export. Prices offered by shippers were very reasonable in view of the state of local markets. Growers who disposed of some of their crop through this avenue were well pleased.

Stone Fruits Industry Trends

Market Worries.—Dessert fruit growers are increasingly worried about the future. Weakening of consumer demand is one of the reasons.

Canning fruit production is expected to increase. These growers and processors also are worried about future markets.

Canning Peach Production.—The heavy tree plantings of recent years have tapered off. The upward trend in production due to post-1956 plantings coming into bearing has commenced. This will continue for three or four years. Production levels of the years 1953 and 1954 have been regained, and with a better spread of varieties.

New Varieties of Dessert Peaches.—Growers have been very interested in the new peach varieties recently introduced. Plantings will prominently feature any which are superior to existing varieties.

Apricot Plantings Down.—Following the heavy plantings of Trevatt in the M.I.A. in 1957-58 and, to a lesser extent, in 1959, the planting rate of apricots has dropped off to below the annual removal rate. Trees planted in 1957-58 are just commencing to crop. As these come into full bearing over the next couple of years a rise in tonnages will occur.

Demand for Prunes Improves.—M.I.A. production is in ready demand. Since the advent of the poly-cell pack, prune sales to local consumers have improved and a fair proportion of the crop from Young has already been sold. Export prices have improved slightly. The final price for the 1961 crop will show a better return than for the two preceding years.

Prune Production on a High Level at Young.—Prune production is expected to increase, but the long-term potential is limited by the small proportion of non-bearing trees and the age of older trees in the Young district. Older plantings at Young are now over 40 years of age but, because of favourable seasons and better attention to cultural practices, their crops are the biggest since the industry was founded there.

Heavy Cherry Plantings at Young.—Expansion of the cherry industry at Young continues. Another 145 acres were planted last year. A record crop of fruit was produced, and production will increase each year for some time yet. Lowered returns last year reduced the planting rate, but if prices return to the 1959-60 level the planting rate will be heavy again.

Scarcity of worked trees is a factor limiting plantings in all cherry districts.

Grower to Consumer Sales Increased.—Sales of fruit direct to consumers continued to grow. This season it helped offset lower prices. Because of the highly perishable nature of stone fruits, the trend is likely to increase.

Miscellaneous Fruit Industry Trends

Declining Interest in Olives.—Some areas of trees in the M.I.A. have been removed or are scheduled for removal, because returns from olives are less than from some other fruits.

Trailing Berry Plantings Increase Slightly.—Plantings of boysenberries and youngberries have increased to about 40 acres in the Batlow district. Demand for these fruits for processing is strong, but heavy labour requirements of the crop will limit expansion.

Increased Interest in Strawberries.—Strawberry planting has increased and seems likely to gain momentum. More suitable varieties, good planting stock, and adoption of modern production methods could make this a very lucrative crop.

Regulatory Services

District and Suburban Inspections

Fruit Fly Control.—This continued to take a major part of the inspectional services during the summer period through home garden complaints, town inspections, and organised town-treatment schemes.

Organised Town-treatment Projects.—Encouraging results were obtained again in the projects operated in co-operation with local Councils and other interested bodies. Projects were operated in the Murrumbidgee Irrigation Areas, and at Narrandera, Hillston, Broken Hill, Menindee, Cobar, Nyngan, Bourke, Narromine and Richmond. Each yielded such results that the organisations concerned want a continuation in 1962-63.

In co-operation with the C.S.I.R.O Entomology Division, this Department's Entomology Branch, and Union Carbide Ltd., twelve towns in the north-western and western areas were subjected to an experimental programme of selected treatments against fruit fly, but the results of this investigation are not available for presentation at this stage.

The town of Richmond was subjected to a combined spray baiting and trapping programme without significant improvement over the single trapping programme of 1960. The combined spray baiting and trapping programme will be repeated, plus a rigid sanitation programme, in the coming year.

There is increasing interest in the organised town treatment method. It is anticipated that greater demands will be made on the Division of Horticulture for technical guidance and supervision in such projects to ensure proper application and timing.

Border Inspection Points.—The inspection points at Euston and Wentworth were maintained in association with the Victorian Department of Agriculture and the Mildura and District Citrus Association, as for 1960-61. Data recorded for each of these points were as follow for the period 1st July, 1961 to 30th June, 1962:—

	Vehicles inspected	Fruit interceptions	Fruit fly intercepted
Euston	283,235	15,323	14
Wentworth	26,887	877	Nil

This is the second successive year that no fruit fly has been intercepted at Wentworth.

Citrus Gall Wasp.—This has received close attention during the winter, through systematic inspections of nurseries and re-sellers of citrus trees. And locality inspections have also been done throughout the metropolitan areas.

Every endeavour has been made to contain this pest within existing known boundaries, but an outbreak occurred in the towns of Gosford and Woy Woy. This is a serious matter, as these outbreaks are within the commercial citrus areas of Gosford district. Prompt, drastic actions were taken by the Department to eradicate these infestations. The actions had the complete support and co-operation of citrus organisations of the area. A continuing campaign will be conducted throughout these areas, to prevent spread to commercial citrus orchards.

Potato Inspections.—These were done in the field and on recognised markets, and the annual check was made on potato growers' licenses.

Bunchy Top of Bananas.—It appears to have been eliminated from the banana areas south of the Richmond River. Occurrence in the northern areas is still extremely low, due to organised early detection and destruction over a long period of years. Total Bunchy Top plants treated in 1960-61 was 1,475; the equivalent of *five plants per* 100 *acres* of bananas in N.S.W. In 1961-62 the incidence was 10.71, the equivalent of *four plants per* 100 *acres.*

Banana Beetle Borer.—It is now of minor importance in N.S.W. because of effective control measures recommended by the Department. Two outbreaks occurred, in the Coffs Harbour and Bowraville districts. Prompt action was taken in co-operation with the Banana Growers' Federation to survey and treat all infested areas. Banana growers within the affected districts voluntarily levied themselves ½d. per case to help meet the cost. The work was supervised by Division of Horticulture staff.

Policing for the Murrumbidgee Irrigation Areas.—Policing of quarantine regulations under the Irrigation Act and Plant Diseases Act was well maintained.

Applications for introduction of fruit from outside sources for processing purposes within the Murrumbidgee Irrigation Areas have increased. The quantities of fresh grapes permitted entry from the Murray River areas of N.S.W. and Victoria each year for wine making are an example. A lot of grapefruit were also permitted entry this year from the Murray River areas and a similar application has been made for 1962-63 season.

Local processing interests in the M.I.A. have the problem of maintaining quality and volume standards to retain labour and market commitments. If production is below requirements within the M.I.A., the processors have to seek supplementary supplies from outside sources. This situation requires careful observation and control to prevent complete breakdown of the existing policy pertaining to quarantine measures for the M.I.A.

The matter of selection and notification by gazettal of points of entry for plants, etc., into the Colleambally Irrigation Area is under consideration. This will be finalised in the coming year, in collaboration with the Water Conservation and Irrigation Commission.

Grape Vine Nematodes.—About 500,000 rooted cuttings were inspected in the Lower Murray areas to prevent possible distribution of infested planting material.

Citrus Maturity Testing Service.—Officers in all major citrus areas guided growers in the early marketing period by testing Washington Navel and Valencia oranges. This has been extremely valuable to the citrus industry. Growers and the trade acknowledge the effect of this measure against immature citrus fruit sales.

Bulk Transport and Newer Types of Containers in Marketing.—The trend towards bulk transport and sales of fruit in containers of large dimensions is in some respects a matter for some concern. The method of transport and its aim to increase sales and distribution is sound in principle, but there is still the need to maintain quality and grading standards. The whole is under consideration with the Legal Officer, to clarify existing powers under the Fruit Cases Act.

Grading and Presentation Standards.—A special Division of Horticulture programme to improve these for all fruits has been designed for 1962-63. It calls for concerted and co-operative action between field and market inspectors and the application of educational and disciplinary measures.

Sydney Municipal Market Inspections.—These Municipal Markets are amongst the largest in the world. The inspectional services have been under review to assure adequacy. A report with recommendations has been prepared. Inspectional staff and facilities might as a result be increased to conform with the needs.

Amendments to Proclamations and Regulations.—At the request of the banana industry a container of one bushel capacity with internal measurements 18 x 13 x 9½ inches was gazetted under Regulation 1 for use in N.S.W. as from 1st July, 1961.

Regulations 21 to 25 (Citrus Grading Regulations) were amended and gazetted as from 28th July, 1961.

A revision of the Plant Diseases Act has been completed by the Legal Officer, and this is now with the Parliamentary Draftsman.

Prosecutions and Warnings.—Eighty prosecutions were instituted under the Plant Diseases Act, mainly in respect of marketing offences and failure to carry out measures for fruit fly control. A total of 597 warning letters were issued for first offences, mainly in respect of marketing regulations.

City Markets and Interstate Supply Inspections

Apples.—Moderate to heavy supplies of 1961 season apples were on hand from all States until well into December. Towards the end of this marketing period the condition of the fruit deteriorated rapidly. From Tasmania the Crofton and Democrat apples were small to medium in size and graded to "Good" because of hail damage. Heavy supplies were also received from Victoria and many consignments were required to be regraded due to hail damage. The late Rome Beauty variety decayed rapidly in the markets and necessitated repacking.

Early in the 1962 season moderate supplies from Queensland were received. Their McIntosh Reds were well coloured. Their Jonathans were less so, and a lot of hail-damaged fruit was received.

The first of the 1962 N.S.W. fruit, from near Sydney, were small, inclined to be immature, and poorly graded and presented. These were followed by Granny Smith from the M.I.A. which, at first, were immature and graded "Culinary". Later, and from other districts, the supplies were heavy, of good quality and size. Grading has been fair. The bulk has been "Fancy" grade.

Pears.—Heavy supplies of 1961 Packhams, Winter Nelis, Josephine and Winter Cole from Victoria were received. These were mainly graded "Good" and lower, because of skin blemish and hail marks. Deterioration of these took place towards the end of the season, and repacking was often necessary. Late supplies of 1961 season pears, mainly good quality Packhams from Orange and Batlow were in heavy demand.

Early in the 1962 season, Clapps Favourite and Williams from Victoria were in heavy supply. These, followed by Packhams, were well graded and in excellent condition. Supplies of excellent Williams, and Packhams later, have been medium to large, and usually "Fancy" grade.

Oranges.—Testing of Valencia oranges, from the commencement of marketing until the end of August, 1961, coupled with tests in the districts, was a great help towards compliance with the maturity standard.

Heavy supplies of coastal Valencias came forward, especially early in the season. Consignments towards the close of the season were mainly "Plain" grade. The main blemish was Black Spot. Valencias from the M.I.A. were in moderate supply and comprised medium to large and "Standard" grade. Murray Valley and Queensland Valencias, similar in supply and size, tended to be in greater demand due to better grading and quality.

Navel orange supplies from the coastal regions commenced early in April. Testing continued into the last week in May, as with Valencias. This, with testing in the district, kept the rejections for immaturity at an all-time low.

Mandarins.—Heavy supplies of small to medium coastal mandarins arrived. Many were "Plain" grade, due to excess blemish. There was almost no demand for the small fruit. Queensland sent moderate supplies of large "Special" and "Standard" grade. These were well coloured and in great demand.

Lemons.—Heavy supplies of N.S.W. lemons were available from the end of 1961 and through the early months of 1962. Mould was continually developing in these lines. They required repacking. Only the well graded "Standard" grade proved to be of any value. Queensland Meyers were in moderate supply, of "Special" and "Standard" grades, medium sized and well coloured but poor keepers. They needed repacking in many instances.

Grapefruit.—South Australian grapefruit were in light supply, well graded and big. The N.S.W. fruit were mainly small to medium, and in unattractive "Plain" grade due to Melanose.

Peaches.—Early coastal peaches were small and poorly coloured. Later the supply was heavy, with well coloured large fruit from all districts. Brown Rot became a major problem in consignments from most districts, and developed to the stage where some consignments were only fit for "Castaway" certificates. Some lines, where repacking was attempted, broke down within hours of repacking.

Plums.—Small Wilson and Santa Rosa plums were in moderate supply early. Large Angelinas and Narrabeens were in good supply later. Brown Rot was a problem with the mid-season to late plums.

Nectarines.—Moderate supplies of medium size nectarines from all districts were badly affected by Brown Rot. Many consignments arrived decayed.

Apricots.—Early apricots from Kurrajong district were the usual unattractive small green fruit. Size and colour improved in later lots. The M.I.A. and South Australian supplies were marred by Brown Rot.

Cherries.—Heavy supplies came forward from Young and Orange. St. Margarets, Rons Seedling, and Eagles were of exceptional size and colour. Brown Rot was again prevalent.

Grapes.—Heavy supplies were received from all N.S.W. districts, and South Australia and Queensland. Quality was average. Maturity standard was watched, by testing from 20th December, 1961, until the last week in January, 1962.

Queensland supplied large consignments of well formed bunches, but 1,568 cases were withheld from sale due to immaturity. Only 269 cases from all other sources were withheld.

Bananas.—Supplies of large, good quality fruit were heavy in the summer; winter supplies were much lighter, and the fruit was smaller and poor.

Pineapples.—Light supplies of medium to large fruit, well coloured, came forward throughout the year. They were in good demand. Very few consignments required repacking because of Blister or Yeasty Rot.

Strawberries.—Heavy Queensland supplies, medium to large and well coloured, were received in good condition. They sold well.

Fruit Fly at the Markets.—It appeared to be on the increase again; 1,225 cases of fruit were destroyed in comparison with 289 cases in the 1960-61 season.

Potatoes, Market Inspections.—Potato inspections took place at Perry Park, Alexandria goods yards, and City Markets.

A good supply was received from Queensland, mainly "New" grade. Because of growth cracks and mechanical injury, and some consignments not bearing brands, 2,230 sacks were dealt with for regrading or branding. A total of 265 sacks were picked over for Potato Moth infestation.

Supplies from Victoria were of good quality, but due to dry conditions in the new year the tubers were generally smaller than usual. A total of 990 sacks were down-graded, and 650 sacks were reconditioned due to Potato Moth infestation.

Floods in the Windsor district wiped out supplies from this source. The N.S.W. crop was consequently light. It came from Robertson, Crookwell, Orange and Maitland districts. In this light N.S.W. crop, 540 sacks were held by grading regulations, and 180 sacks were reconditioned due to Potato Moth infestation.

Import Inspections

Importations of overseas plants and plant products were examined for the Commonwealth Department of Health under the Quarantine Act.

Seeds.—In all, 21,313 sacks of grass and clover seed were imported; compared with 28,821 sacks in 1960-61. Most was from New Zealand. A few large consignments came from U.S.A. A total of 445 sacks were required to be fumigated for insect infestation. Other lots had to be recleaned to remove prohibited seed or soil particles found in samples.

An increase of about 40,000 lb. of vegetable seed on last year's figure meant that 165,525 lb. were imported this year. Flower seeds decreased by 7,000 lb. to 20,368 lb. Main source of vegetable and flower seed was the U.S.A. Much smaller quantities came from Holland, New Zealand and United Kingdom.

Nursery Stock.—Nursery stock importations were much less than in 1960-61. Importations were as follow: Orchids, 4,907; bulbs, tubers and rhizomes, 2,902; ornamental plants, 1,561; rose bud eyes, 2,880; Lily of the Valley pips at 20,000 were about the same as in 1960-61. These were from Germany and given hot water treatment before release. Insect infestation was in various consignments. These were treated before release to the quarantine nursery for further inspection during the growing period. Where diseased plants were detected they were either destroyed or returned to the country of origin.

Parcels Post.—All parcels containing plants or any form of plant material from overseas were examined. A total of 7,615 parcels were examined and 2,030 were detained for further examination, treatment, or destruction. The contents were mainly plants, bulbs, seeds, peanuts, popcorn, and raw cotton samples.

Cases and Packages inspection.—On all overseas wharves, cases and packages containing general merchandise were examined daily for Sirex wasp and other wood-boring insects. In all, 604 cases were detained because of Bark Borer or Longicorn in the beetle or larvae stage, and 261 cases contained active signs of Sirex wasp. A total of 1,016 bales or baskets and 627 casks containing bamboo slats or bands were inspected. All cases, bales, baskets and casks were treated under supervision either by fumigation or heat treatment, or destroyed by burning.

Dunnage.—A new phase of work developed this year was the treatment of dunnage from overseas vessels, left on the wharf awaiting re-use. Some 292,250 super feet of dunnage has been fumigated under supervision, and this obligation placed on the shipowners has ensured a regular clean-up on the wharves and prevented any possible infection from this source.

Passengers' Baggage.—A total of 223 passenger ships were met to examine goods or articles brought to attention by Customs Department. A large quantity of prohibited and/or infested goods was detained for treatment or destruction—mainly pome and citrus fruits, plants, bulbs, seed and packing cases.

Timber.—Importation of timber was 25 million super feet less than in 1960-61. But the total of 202,839,000 super feet was a substantial import, second only to the record import of 227,940,000 in 1960-61. The timber was remarkably free of borer infestation. Only a few small consignments of Borneo Meranti were quarantined for borer. These were heat-treated under supervision.

General.—During the year 990 ships entered the Port of Sydney and discharged goods subject to plant quarantine inspection. Some of the main imports were dates, peanuts, copra, bamboo products and raw cotton. Much of these was treated under supervision by fumigation or heat treatment. Some was destroyed by burning.

Chemical Control of Vineyard Weeds

Great progress has been made in vineyard weeds' control by use of selective herbicides and modern labour-saving equipment. The outcome of several years research was published in the *Agricultural Gazette of N.S.W.*, May, 1961, and reprinted in August 1961 as a miscellaneous publication.

Export Inspections

Exports of fresh fruits, seed, rice, flour and wheat were inspected for the Commonwealth Department of Primary Industry, under the Commerce (Trade Descriptions) Act.

Citrus Fruits.—All Navel orange exports went to Singapore. They numbered about 5,000 cases, only half the 1960-61 figure. Rejections were slight, being only 100 bushel cases, for mould and excess blemish.

Valencia orange exports increased. The total was 53,993 cases or cartons. Destinations were the United Kingdom, 3,985; Germany, 500; Pacific Islands, 11,432; Hong Kong, 4,069; and Singapore, 34,007. Rejections totalled 1,579 cases, for such reasons as mould, Black Spot, bad clipping, excess blemish, staleness, and rind breakdown.

An innovation was experimental shipments of oranges packed in 4/5th bushel fibreboard containers. These were usually packed under Departmental supervision, at the packing sheds, and precooled to 45°F. before shipment. Out-turn was satisfactory.

A total of 298 bushel cases of lemons was exported to Singapore.

Apples.—Shipments, particularly to the United Kingdom, were heavy. A total of 135,419 bushel cases of New South Wales apples was shipped: 102,471 to the United Kingdom, 5,732 to Singapore, 4,812 to Antwerp, and 22,404 to the Pacific Islands. All but 5,971 cases were Granny Smith.

A total of 43,741 bushel cases of Queensland apples was shipped through the Port of Sydney to the United Kingdom and Germany.

Rejections were heavier than normal. The reasons were broken skins, spray residue, bruising, sunburn, Bitter Pit, over-maturity, San Jose Scale, hail damage and unsuitable cases.

Pears.—The pears shipped went to New Guinea, Singapore, Hong Kong, Fiji and the Pacific Islands and totalled 75,239 bushel cases.

Export Seed.—Large quantities, mainly for pastures, were exported—*Paspalum dilatatum,* clover, millet, carpet grass *Phalaris tuberosa,* and palm seed. These were consigned mostly to the U.S.A. and New Zealand. The Palm seed was consigned to Japan, Belgium and Italy.

Rice.—A total of 36,961 tons of rice was exported, 410 tons less than in 1960-61. New Guinea was the main destination with 20,058 tons, followed by the United Kingdom, 5,040 tons. New Zealand, Hong Kong and the Pacific Islands took most of the rest.

Flour.—Export of 192,311 short tons of flour was 794 short tons more than in 1960-61. Of it, 62,045 tons were shipped to Colombo. The rest went to the United Kingdom, Red China, Borneo, Malaya and the Pacific Islands. Beetle infestation was very light, found in only a few trucks from Wellington Flour Mills, and one truck from Dubbo.

Wheat.—Exported wheat for which International Health Certificates were issued totalled 921,658 tons, on 101 shops; 5,319 tons were rejected, for insect infestation. Of the total tonnage, 698,323 tons were shipped from Sydney and the remainder from Newcastle. Destinations of the wheat were China, 616,935 tons; India, 5,460 tons; Middle East, 37,329 tons; Europe, 155,462 tons; Japan 15,524 tons; Hong Kong, 1,125 tons; and South Africa, 89,823 tons.

DIVISION OF ANIMAL INDUSTRY

General

Veterinary Diagnostic Services, Glenfield

Specimens Registered for Diagnosis.—These increased to 38,336, compared to 29,419 and 30,534 respectively in 1959-60 and 1960-61. The 1961-62 total comprised 19,440 from cattle, 8,078 from sheep, 5,315 from poultry, 4,993 from pigs, 67 from horses, 248 from miscellaneous birds and animals, and 195 from other miscellaneous specimens.

Inspections under Noxious Microbes Act.—These totalled 32, compared to 12 and 33 respectively in 1959-60 and 1960-61.

Toxicology Specimens.—Specimens from 249 sources were examined. They led to 284 analyses for arsenic, 97 for lead, 28 for phosphorus, seven for strychnine, and 113 miscellaneous analyses.

In 56 mortalities *arsenic poisoning* was the cause, accounting for death of 73 cattle, 313 sheep, one horse, five pigs, and 15 fowls. In 10 mortalities *lead poisoning* was the cause, accounting for death of 22 cattle and four pigs. *Strychnine* caused the death of 690 fowls in one overnight mortality. Water supplied to the birds was found to contain strychnine 220 ppm—a suspected case of malice.

Free *sulphur* to the extent of 19 per cent, on an undried weight basis, was recovered from the rumen ingesta of a dead cow. Three deaths had occurred within a few hours of signs of illness. Autopsy revealed pale livers, and gastro-enteritis.

Rabbit Myxomatosis

Demand for Myxoma Virus.—There was marked increase in demand for myxoma virus—460 individual requests for virus, compared to 288 and 181 respectively in 1959-60 and 1960-61. In response, 135,325 doses (3,633 ampoules) were despatched in 1961-62.

The increased demand is thought to be outcome of the publication of comparative virulence tests. These had indicated that the Glenfield strain was superior to the standard strain of virus. A lot of publicity, particularly in the Victorian press, was given to these findings, and many of the requests were for the "new supervirulent Glenfield" virus.

Interstate Supply of Virus.—Control authorities in other States also considered that test releases of the Glenfield strain should be made. So, some 92,000 rabbit doses of virus were sent to Victoria, South Australia, Western Australia and Tasmania.

Virus Despatches Over 12 Years.—The numbers of requests for virus and the amounts sent, free on request, from Glenfield since the initial releases in 1951 are tabulated:—

Year	Doses	Ampoules	Requests
1961-62	135,325*	3,633	460
1960-61	37,300	1,492	288
1959-60	39,000	1,560	181
1958-59	126,625	4,997	653
1957-58	152,425	6,097	661
1956-57	200,200	7,763	742
1955-56	194,200	3,884	542
1954-55	280,850	5,617	673
1953-54	296,900	4,514	558
1952-53	279,200	3,389	....
1951-52	249,600	....	....
1951 Feb. to June	21,600	....	....

* Includes 92,000 doses to other States.

Artificial Insemination Work

Test-Mating of Bulls.—Twenty-six bulls of six breeds were received for test prior to entry for artificial insemination purposes, comprising 16 from New South Wales sources, five from Victoria, four from Queensland, and one from South Australia. Some provisionally selected bulls were rejected on preliminary health tests without coming to Glenfield.

There are still nine bulls at Glenfield for completion of tests. During the year 24 left Glenfield after testing. They were respectively: Ten to Berry Artificial Stock-breeding Centre (four Friesians, two A.I.S., two Jerseys, two Aryshires); eight to Aberdeen Artificial Stock-breeding Centre (one Friesian, one A.I.S., three Jerseys, three Guernseys); three (a Friesian, a Jersey, a Guernsey) to abattoirs because of vibriosis; and three (an Aberdeen Angus and two Jerseys) back to the owners as unsuitable.

Training of Inseminators.—Nine candidates attended Artificial Inseminators' Schools this year. Five received the theory and initial practical training at Glenfield Station, and four at the Infertility Laboratory, Berry. Eight completed the requirements, passed the examinations, and are now Certificated Inseminators employed by the N.S.W. Milk Board.

Research for Animal Industries

Sheep Diseases Research, Veterinary Station, Glenfield

Goitre in Lambs.—Further investigations were made with radioactive iodine 131 to see whether there is a goitrojenic plant on the properties where goitre occurred in 1959. There was no positive result but, as in 1960, there was very little goitre. No further work will be done until sufficient goitre recurs.

Muscular Dystrophy in Lambs.—Five more trials were done to study prevention. The 1960-61 findings were confirmed. Selenium and vitamin E each prevented the condition; assessed by the serum G.O.T. test.

Selenium effect on lambs' growth rate was studied. In four periods, all in lambs from untreated ewes, growth rate increases were seen in selenium treated lambs, but in only one case (13.4 lb. per month in treated lambs, 8.9 lb. per month in control lambs) was the difference striking. In one trial, selenium treated lambs grew significantly less than control lambs.

Carbon Tetrachloride Poisoning in Sheep.—In view of carbon tetrachloride poisoning's association with ingestion of plants containing oxalate, the effect of injected oxalate on kidney function has been studied. The results so far suggest that the oxalate blocks individual tubules with crystals of calcium oxalate, rather than it has direct toxic action on the kidney cells.

Heavy mortalities have occurred where sheep have fed on Kurrajong and Stinkwort. Feeding trials to demonstrate whether these plants render sheep more susceptible to carbon tetrachloride poisoning have been conducted. Only one death occurred in the trials, but analysis of plasma from the animals indicated that carbon tetrachloride caused more damage to the liver in the Stinkwort-Kurrajong group than in the controls.

Itch Mite Infestation.—The first series of trials have ended. The results, not entirely satisfactory, emphasized the parasite's unpredictable behaviour and the difficulty of conducting this sort of trial.

Infestation of the untreated control sheep declined a lot in the summer. The main findings were that: (*a*) chlorinated hydrocarbon CX99 was as efficient as arsenic at 0.20 per cent.; (*b*) arsenic at 0.15 per cent and 0.10 per cent was not as efficient as at 0.2 per cent.

In one group (treated with arsenic 0.15 per cent, rotenone, glycerine and phenols) findings were negative for eleven months, but a month later eight out of nine sheep were positive.

Two more trials have been started, using Nankor, Rotenone, Thiabendazole (internally) and arsenic. Early signs are that neither Thiabendazole or Nankor gives enough control when administered systematically.

Lice Infestation.—The diffusion rate of diazinon in wool after tip spraying, and its efficiency and the period of protection against the body louse, are under trial.

The efficiency of various dipping techniques (plunge dips, shower, and tip spray) at different periods after shearing are under trial, using various insecticides, including a Rotenone preparation (0.003 per cent), Dieldrin (0.0002 per cent.), Nankor (0.33 and 0.025 per cent.), and Aldrin (0.125 per cent). Symptoms of organo phosphorus poisoning were shown by sheep plunge-dipped in Nankor 0.3 per cent, but they recovered.

Anthelmintic Trials.—Further work was done to determine the efficiency of Thiabendazole on immature Trichostrongylus, immature Haemonchus, and mature Oesophagostomum.

Field trials were commenced in several areas to determine the effects, on fat lamb production and wool growth, of maintaining sheep virtually free of parasites by regular Thiabendazole drenching.

Administration of phenothiazine in molasses, as a lick, is being tried. Percentage of sheep eating the lick, and rate of consumption by sheep given free choice, are to be first determined.

Ovine Brucellosis.—Some 3,815 ovine sera were submitted to the complement-fixation test, 58 per cent from practicing veterinarians and 42 per cent from Departmental officers.

Results of the serological examination, the correlation with presence of lesions, and incidence in the various breeds have been recorded.

Sheep Nutrition Research, Glenfield

Drought Feeding of Sheep.—Effects of varying the protein intake at a maintenance level of feeding are being examined. Common feedstuffs are being fed to 4-tooth Merino, Polwarth and Corriedale wethers.

The first phase of this trial was to observe the effect of feeding a medium protein roughage on wool production properties, and blood composition.

At daily intake levels of 52, 66 and 72 grams of protein, Merino wethers maintained at constant body weight over a period of 13 weeks showed no significant difference in greasy fleece production. Groups of Polwarth wethers fed 53 and 73 grams of protein daily over the same period did not differ significantly in greasy fleece production. At lower levels of protein and energy intake body weights decreased and there were significantly lower levels of greasy fleece production in all breeds.

Further work will examine the wool properties of the fleece samples taken.

Comparisons between Merino, Polwarth and Corriedale wethers when hand-fed with low-medium protein roughages have been part of the foregoing study.

Unrestricted feeding of 5 per cent crude protein roughage to the three breeds reduced the body weights. Mean intake by the Corriedales was 0.75 Kg per sheep per day while the Polwarths and Merinos ate an average 0.66 Kg and 0.54 Kg per sheep per day respectively. Mean body weight losses over 13 weeks were 9.3 Kg, 7.0 Kg and 7.7 Kg for the Merino, Polwarth and Corriedale respectively. Efficiencies of greasy fleece production, measured as wool production per food intake, were in the ratio of 100:81:95 for Merino: Polwarth: Corriedale.

When the energy level fed to all breeds over a 13 weeks' period was such that 2-4 Kg of body weight loss resulted, the Merino, Polwarth and Corriedale had an average greasy fleece production of 0.98, 0.82 and 1.03 Kg respectively. Efficiencies of food conversion into greasy fleece weight were in the ratio of 100:81:81 for Merino: Polwarth Corriedale.

For the three breeds further information is being obtained through Temora Experiment Farm on efficiency of wool production at higher levels of energy and protein intake. The higher levels are increasing the body weight of each breed. Present indications are that the efficiency of converting energy intake into liveweight gain is the same for the three breeds when allowance is made for the amount of energy intake needed to maintain the breed. Results on the wool production and efficiency are not yet available.

Flushing Trial.—The effect of different planes of pre-mating nutrition on fertility of Merino ewes has been examined under pasture conditions at Condobolin Experiment Farm.

In store-fat condition, 175 full-mouthed ewes were divided into two groups after weaning the lambs. One group was placed on a high plane of nutrition, the other on a low plane. Six weeks later a further high plane-low plane division within the groups was made. Then six weeks later (six weeks before a late spring mating) a similar further division was made. The ewes were mated to Border Leicester x Merino rams, and mating date was recorded.

The difference between mean body weight of the High- High- High- and the Low- Low- Low groups at start of mating was 23.7 lb. The Low- Low- Low- group had lost 11.9 lb. in the total pre-maturing observation period.

There was a satisfactory percentage of wet ewes in all groups. There was no significant difference between the percentage wet ewes of groups, although the only 100 per cent case was the Low- Low- High group. Multiple births were recorded in all except the Low- Low- Low and Low- High- Low groups. Greatest number of multiple births occurred in the Low- Low- High (18 per cent) and the High- Low- High (14 per cent) groups.

Mean greasy fleece weight difference between the High- High- High Group and the Low- Low- Low group was 1.3 lb. over the whole year, 18-24 weeks of which were under the set experimental conditions.

The results of this trial have yet to be fully analysed statistically.

Early Weaning Trial.—Forty lambs from the foregoing Flushing Trial were weaned at an average age of 46 days on *ad lib* quantities of either a mixture containing 9 per cent crude protein or 17 per cent crude protein.

Another 80 lambs of the same age and breeding were left with their dams, and divided equally into two groups. One group was hand-fed either 9 per cent or 17 per cent crude protein mixtures. The other group was left under paddock grazing, at normal stocking rates for the season and location.

The observation period will end at the close of the tenth week. No lamb or ewe loss has been recorded in the first three weeks of this current experiment. Lambs weaned on to the 17 per cent crude protein mixture have consumed more, and made faster gains, than those weaned on to a 9 per cent crude protein.

"Open-face" *vs* "Face-cover" in Merino Flock Selections

Early results whilst forming the "face-cover *minus*" and "face-cover *plus*" flocks by selection in the Merino Sheep Breeding and Selection Programmes at Trangie Station have shown little difference in wool production between the two; *but* for the first three years the open-face flock has averaged 35 per cent more lambs than the "face-cover *plus*" flock.

(The visual education aids at this sheep industry field day were photographic enlargements from field officers' camera work).

Sheep and Wool Research at Trangie Research Station

Breeding and Selection Programmes

Selective Breeding of Merinos for Production Characters

High Heritability of Fleece Weight and its Components.—Current shearing results have clearly shown the high heritability of fleece weight and its component measurements. Results from the single-character selection groups show the strong genetic correlation between high fleece-weight and broad-crimping wool, whereas body weight, skin fold and staple length have but slight association with the production measurement.

The Selection Demonstration Flock (selection made on measurements) is now clearly ahead of the Stud, while still maintaining its plain bodied, open faced, big framed characteristics.

An extension of this work is underway. The extension will estimate the difference between Trangie and stud environments and so enable comparison between the Selection Demonstration Flock and stud sheep in general.

Rapid Fleece-Sampling Method Developed.—A rapid method has been developed, using the shearing machine. The method enables accurate ranking of hogget rams on greasy-fleece weight. One South Australian stud has already put the technique into operation. It uses the method to reserve rams and also to rank sale rams into price groups.

Comparisons with "Bungaree" (S.A.) Merinos.—Initial comparison has been made between our own Peppin flocks and "Bungaree" South Australian Merinos. Present indication is that the "Bungarees" outproduce the Trangie Station's flock Peppins by 30 per cent and Stud Peppins by 20 per cent of clean wool.

Poll Merino Breeding

Poll Gene Does Not Effect Production.—Two experiments, comparing polled and horned rams and wethers, have shown, contrary to expectation, that the poll gene has no deleterius effect on production, nor does the dehorned ram have productive advantage over the horned ram.

Poll Gene Effect on Fertility.—Fertility of polled and horned rams have been compared on the property of a co-operating grazier. Initial results slightly favour the horned group.

Selection Influence on Efficiency of Feed Conversion to Wool

The feed conversion efficiency of "Fleece Plus", "Fleece Minus" and "Random" ewes have been examined on a low plane of nutrition, with the sheep held at steady body-weight and body-composition. Under these conditions, "Fleece Plus" sheep were still significantly more efficient (lower maintenance requirements) than the other two flocks.

Influence (?) of Light on Wool Growth

With penned sheep on ad lib feeding, there was no evidence of a light-effect on wool growth. Irrespective of the light-pattern, sheep grew wool at a uniform rate throughout the year.

Influence of Selection on Fertility

Twinning vs *Singles.*—Examination of five years' production records of ewes born as twins, compared to ewes born as singles, has shown in favour of the singles, an average difference of three per cent in fleece-weight and body-weight at 18 months of age. Twin ewes produced nine per cent more lambs than singles.

"Open Face" vs *"Face Cover".*—Initial results during formation of the Trangie Station's "Face Cover" Selection Groups have revealed little difference in wool production between the two flocks. During the first three years, the "Open Faced" Flock has averaged 35 per cent more lambs than the "Face Cover Plus" Flock.

In an extension of the research to field circumstances, in association with District officers of the sheep and wool service, initial results from two Mudgee properties have confirmed the association between heavy face-cover and reduced lambing percentage.

Adverse Effect of Wrinkly Ram.—Further examination of the fertility difference between the "Folds Plus" and "Folds Minus" Selection Groups has implicated the wrinkly ram as a cause of low conception rate and reduced twinning-percentage. Heavy birthweight of single lambs has been demonstrated as a likely cause of the high death rate of "Folds Plus" lambs and ewes at lambing time.

Environment Influence on Ram Fertility

Light Influences Semen Quality.—Studies of penned animals have shown that seasonal lighting has some control over semen quality. Semen is best in autumn (reducing daylight hours) and worst in spring (increasing daylight hours).

A study of rams at pasture did not confirm these results, nor those of other workers. Semen quality was at its best during spring-summer; probably a result of nutritional influence.

Artificial Insemination of Sheep

Post-insemination Teasing.—A confirmatory experiment has again shown the advantage of teasing ewes after insemination. The conception rate was improved overall by 7 per cent.

Trangie Station's Sheep Work With Other Experiment Farms and Stations

Border Leicester x Merino Fixation (Condobolin Experiment Farm)

Spring vs. Autumn Mating.—The flock of F1 and F2 ewes in this project (primarily concerned with *fixing* the Border Leicester x Merino as a breed source of mother ewes for fat lamb production) has now been split into spring—and autumn-mated sections. The first autumn-joining, in 1961, yielded 131 per cent of lambs, whereas the initial spring-joining yielded only 2 per cent of lambs.

F1 vs. F2 Hoggets.—The initial comparison of F1 and F2 hogget ewes showed little difference either in production level or variation of production characters.

Poll Gene, and Lamb Growth Rate (Tamworth Research Station)

Presence of one poll gene did not influence lamb growth.

Partial castration resulted in improved growth rate relative to wether lambs and there was increased economic return when lambs were sold on a weight and grade basis. However, saleyard values heavily penalised entire or sterilised rams.

Dorset Horn vs. *Cheviot as Lamb Sire (New England Research Station)*

The Dorset Horn ram was much superior to the Cheviot as a lamb sire.

Castration treatments showed up the superior growth rate of entire and sterilised ram lambs. Male lambs were heavily penalised in the saleyard.

Sheep Industry Research at Leeton Research Station

Reproduction in (Border Leicester x Merino) Ewes

Seasonal Reproduction Variations.—This experiment, begun in September, 1958, ended in May, 1962. Statistical analysis is proceeding towards publication.

Results for 1961-62 confirmed the earlier observations and are summarised as follows:—

Lowest Mating Period in Spring.—Mating activity was lowest in the September-October-November-December period. In October and November there was almost complete absence of mating activity.

Lowest Lambing from Spring Matings.—Lambing percentages from matings later than in the spring progressively increased until a peak was reached from autumn (May-June) matings. Progressive decline in lambing percentage again occurred from matings in the winter to early spring period. The differences in lambing percentage were due to differences in:—ewes failing to mate; ewes mating but failing to lamb (they get in lamb more readily in autumn); twinning-rates, from matings at different periods.

Ewes Mating Behaviour After Lambing.—This experiment, done as part of the afore-mentioned one, has now also ended. The 1961-62 results confirmed the findings of previous years, summarised as follows:—(*a*) where ewes lamb well within the breeding season the typical period before mating is 35-40 days; (*b*) if ewes lamb before the end of the breeding season, some mate before the start of the non-breeding season and others not until the following breeding season; (*c*) if ewes lamb near the end of the breeding season, heat periods do not occur until the following breeding season; (*d*) where ewes lamb at the start of the breeding season, the lag between lambing and first heat is longer than in the case of ewes that lamb well within the breeding season.

Nutrition and Body Condition re Breeding Season and Fertility.—Concerning the effect of body condition on the start of breeding season in (Border Leicester x Merino) ewes, a 1960-61 experiment had shown that ewes in poor condition exhibited oestrus 2-3 weeks later than fat ewes well-fed in late winter and early spring. Comparison was also made between fertility levels of traditional-flushed ewes (kept in poor late-winter condition and put on a raising plane of nutrition three weeks prior to, and during, mating) and ewes on a continuous high nutrition plane. The ewes were mated to Dorset Horn rams on 29th December, 1960, for six weeks ending 9th February, 1961.

The continuous high nutrition plane gave higher incidence of oestrus, higher incidence of lambing, higher incidence of twins and therefore higher lambing percentages. The outstanding point is the difference in incidence of lambing. It accounts for most of the difference in lambing percentages.

The 1960-61 experiment has been followed up by an experiment to study in more detail the effects of body condition and nutrition plane on the start of the breeding season and fertility. Also, a study was made of the effect of plane of nutrition and body condition in the early part of pregnancy (from end of mating to six weeks before lambing). The factorial experiment provided:—three planes of nutrition between 14th September, 1961, and 16th November, 1961; two planes of nutrition from three weeks before mating to the end of mating, that was from 16th November, 1961, to 18th January, 1962; and two planes of nutrition from end of mating to six weeks before lambing, that was from 18th January, 1962 to 14th March, 1962. For the last six weeks of pregnancy and during lambing, all ewes grazed together on a high nutrition plane.

Lambing has just ended. Therefore results on growth rate of lambs are not yet available. Analyses of the effects of body condition and plane of nutrition on occurrence of oestrus, lambing percentages, neonatal mortality and birth weight of lambs are proceeding.

Some broad, interim findings were as follows: (i) body condition and nutrition plane had no more than a minor effect on start of the breeding season (confirming the previous year's work); (ii) body condition and nutrition plane did not influence the proportion of ewes exhibiting oestrus, nor the proportion of ewes lambing; (iii) high body weight and high nutrition plane immediately prior to and during mating resulted in the highest proportion of ewes conceiving to first service; (iv) overall flushing (high nutrition plane from three weeks before mating until the end of mating) increased the lambing percentage 15 per cent over that of unflushed ewes; (v) surprisingly, body weight at mating apparently did not affect lambing percentage.

In the 1960-61 experiment the low nutrition plane up to mating considerably reduced the proportion of ewes exhibiting oestrus and lambing, but in the 1961-62 experiment nutrition plane and body weight had no such effect. Probable explanation of the inconsistency is that in 1960-61 the low nutrition plane was much lower than that of the 1961-62 low nutrition plane groups. Importantly, the 1960-61 low-plane treatment was akin to the normal at this Leeton Station for commercial flock ewes between weaning and mating.

Pre-mating Shearing re Ewe Fertility.—An experiment from December, 1960, to July, 1961, studied the effect of shearing ewes ten days before mating and shearing at normal time in July. The ewes were mated to Dorset Horn rams on 29th December for six weeks. Lambing percentages did not differ.

Merino vs. (*Border Leicester* x *Merino*) *Ewes for Fat Lamb Production*

The first year of this experiment has been completed. Dorset Horns are the sires.

The progress results overall show the crossbred ewes' superiority. They returned £2 19s. 3d. per ewe mated against £1 19s. 3d. from the Merinos.

The results are as yet to be accepted with caution, partly because the Merino ewes were mated only one month after arriving at Leeton from Trangie, whereas the crossbred ewes were at Leeton 12 months before mating and better acclimatised. The Merino ewes were also affected by internal parasites, perhaps purely circumstantial.

The Merino ewes showed obvious clinical signs of internal parasite infestation shortly after lambing, whereas the cross-bred ewes appeared unaffected; and faecal ova counts confirmed it. An interesting feature was the small superiority of the Merino ewes' greasy-wool production and wool price, Merinos being genetically higher wool producers cutting fleeces of higher quality. The internal parasitism of the Merino ewes in this experiment may account for the near lack of superiority in wool production.

Long-term Study of Factors Affecting Ewes' Breeding Season.—A long-term study of certain of the factors affecting the breeding season of (Border Leicester x Merino) ewes has been started. Factors to be studied are:—

(i) Ewe's birth period (autumn vs spring).

(ii) Ewe's age.

(iii) Ewe's previous breeding-performance.

The ewe's puberty accession will also be studied.

The ewes for this work are being bred at Yanco Agricultural Research Station for transfer to the Leeton Station at weaning. The first group was transferred in February, 1962, and at this time was joined to vasectomised rams, until the end of May. In this period 67 per cent. exhibited oestrus, with 30th April as the norm date of first oestrus, but with a range from 30th March to 31st May.

Growth Rates of Shorn vs. *Unshorn Lambs and Weaners*

Lambs.—Normally, farmers shear carry-over lambs, especially in summer, in the belief that shorn lambs grow at a faster rate than those left in the wool. There is little factual information in the literature and especially for this district.

Because suitable lambs were available and were being carried over in conjunction with another experiment, the chance was taken to study the effect of shearing on growth rate of carry-over lambs.

The lambs were born in September, 1961, weaned at mid-January, and divided into two groups on 5th February, 1962. One group was shorn, the other left unshorn. The experiment ended on 11th April, 1962, when the lambs were weighed, and valued by a butcher and a stock and station agent.

The shorn lambs had gained only an extra 3 lb. over woolly lambs; return average per woolly lamb was £2 17s. 6d., while return per shorn lamb was £2 12s. 6d. This included the value of wool shorn in February, but not the cost of shearing. Obviously, it did not pay to shear the carry-over lambs.

Weaners.—Similarly, a group of 500 ewe weaners was divided into two on 5th February, 1962, one group shorn, the other unshorn. The growth differences have been small. Valuation will be after both groups are shorn in July, 1962.

Sheep Production per Acre

This experiment has completed its third year, except that 1961-62 wool data is not available until shearing in July.

The 1961-62 growth rates of lambs at each rate of stocking were very disappointing so the lambs were not slaughtered. Carcase weight per lamb and carcase weight per acre were therefore estimated, by calculating 40 per cent. of lamb liveweight at 131 days of age, when the lambs were removed from the area. At this time, the lambs from each rate of stocking were valued by three independent valuers, separately, and their values were averaged.

The major conclusions for the two years 1960-61 and 1961-62 were that production per head is maximal at low rates of stocking and the all-important economic factor, production per acre, is maximal at the highest rates of stocking.

Cattle Research, Veterinary Station, Glenfield

Diseases Research

Fascioliasis in Cattle.—In co-operation with the C.S.I.R.O. further observations were made on six calves artificially infected with *F. hepatica metacercaria.*

Examination of hourly faecal samples from an infected calf, through 24 hours, to determine diurnal variation in ova output, revealed maximum output at the 8 a.m. reading.

To observe the effect of C C14 injection on blood levels, and liver and kidney function, plasma samples have been collected for G.O.T., Bilirubin, urea and creatinine analysis.

To observe the tissue effect of C C14 given subcutaneously and intramuscularly the drug was given at various dose rates, in various mixtures with paraffin and procaine, and in various sites. Paraffin alone was also injected. Post mortem examination revealed necrosis of muscle tissue at a number of sites.

Anthelmintic efficiency of C C14 injection was satisfactory.

Insecticidal Dipping of Calves.—Further trials were conducted with young cattle to determine any toxic effects produced by a number of insecticides. In each case three calves were dipped for 12 seconds on four occasions, at three day intervals, in double the strength recommended by manufacturers. Diazinon (Neocidal), Asuntol, Trithion (Dagadip), Delnav (Bercotox), and S.D. 4294 were used.

Samples of the wash and hair were analysed. Except for mild symptoms in a very young calf dipped in Diazinon no toxicosis was observed.

Internal Parasite Survey and Anthelmintic Tests.—Effect of worm parasites on adult cattle were further studied through Leeton Experiment Farm and at Hartley. At both places *Ostertagia* was found as a likely cause of the "unthriftiness".

At Leeton observations were made on the effect of a number of anthelmintics against this parasite. Angus cattle were used. Thiabendazole proved the most efficient against both mature and immature *Otsertagia.*

Mastitis.—Studies are continuing on the value of a *Staphylococcus* vaccine against mastitis in a number of Departmental herds, and on the role of milking machine efficiency on mastitis.

This year 230 milk samples were received for examination and 164 showed cellular changes indicative of mastitis. Cultural examination again revealed Staphylococci as the main cause—isolated from 52 per cent of the samples. Streptococci were recovered from 37 per cent.

The majority of the Staphylocci and Streptococci isolated were tested for antibiotic sensitivities. The results were:—

Antibiotic	Streptococci		Staphylococci	
	No. Tested	Per cent Sensitive	No. Tested	Per cent Sensitive
Chlorotetracycline	23	100	55	93
Chloramphenical	23	100	54	100
Erythromycin	23	100	54	88
Penicillin	23	50	53	19
Streptomycin	23	100	54	86
Oxytetracycline	23	96	54	93
Tetracycline	23	96	54	95
Triple Sulpha	23	84	54	50

It should be noted that the great majority of the samples received were from problem cows where the normal antibiotic therapy was ineffective.

Johne's Disease.—Comparatively few cases of Johne's Disease have been reported in N.S.W., and usually in individual imported animals, some years after coming into Australia. On only two properties has the disease seemed established, and when animals from these properties are consigned for slaughter they are subject of co-operative work with the C.S.I.R.O.

Work to evaluate the complement-fixation test's accuracy in detecting infected animals has been planned. This year, tissues and sera from 31 animals were examined. Three of the animals were positive to the complement-fixation test, but *M. johnei* was not found on cultural examination. Of the 28 animals negative to the test, *M. johnei* was recovered on culture from one only. The number of animals so far examined is not enough for an evaluation of the C.F. test.

Bovine Infertility.—A total of 3,305 individual bovine samples passed through the infertility section during the year. In 2,643 cases, the vaginal mucus agglutination test for vibriosis was applied. Of these, 1,318 mucus samples were from 167 herds not previously examined, and positive and/or doubtful reactors were found in 102 of the 167 herds. There were 317 positive and 134 doubtful reactors among the 1,318 samples. In most of the herds only a small proportion of the cows was tested.

Because the vast majority of specimens were from dairy herds, evidence on vibriosis incidence in N.S.W. beef cattle was sought. A total of 709 mucus samples, in 43 consignments from six widely dispersed abattoirs (Homebush, Grafton, Goulburn, Wagga, Dubbo and Orange), was V.M.A.

tested. Some 39 per cent. gave positive or suspect reactions, 176 positive, and 99 suspect. Of interest, about 50 per cent. of cows in this abattoir survey were pregnant.

Whilst the number of specimens examined has increased markedly, the number of herds from which *Trichomonas foetus* is recovered has decreased. The adopted control measures have had good effect, particularly where artificial insemination has been possible.

Results of work to simplify and standardise a mucus agglutination test for trichomoniasis have so far been disappointing, despite use of a number of antigen preparations with both live and dead organisms.

Recovery and typing of the vibriosis causal organism are desired but far more difficult than for trichomoniasis. Fast-growing contaminants are one reason. This year's efforts included trials with *V. fetus* cultures suspended in whole milk with an admixture of various common Gram-positive and Gram-negative bacteria. Rapid deep freezing did not destroy the *Vibrio fetus* organisms, but many of the contaminants also survived. Further antibiotics work is now contemplated.

Observations on typing of vibrios continued, and did not support a view that aerobic growth is an identification characteristic of non-pathogenic vibrios. Vibrios from an aborted ovine foetus from Western Australia and from aborted bovine foeti in New South Wales were grown under aerobic conditions.

Two ovine strains failed to grow in a 1 per cent glycine medium, thus resembling *V. fetus* var. *venerealis* (the bovine infertility type, in the latest classification) rather than *V. fetus* var. *intestinalis*, according to the laboratory criteria listed by Laing (F.A.O., 1960). Possibly, in adapting itself to environmental differences, a given strain of vibrio comes to have different effects on a host, as well as different biochemical characteristics.

Further slight modifications have been made in the method of preparing *V. fetus* antigen.

Richness of growth can vary with liquid culture depth. More long chain forms tend to form in a liquid medium. If they are in the antigen used for agglutination tests their tendency to settle out can confuse especially if interpretation is influenced by amount of deposit.

In additon to being glass-wool filtered, the bulk *V. fetus* antigen is allowed to stand for several days. The supernatant fluid is then separated from any deposited long forms. Antigen has been supplied for use at the Infertility Laboratory, Berry, and at Sydney University, and in New Guinea.

Dairy Cattle Infertility Research, Berry Laboratory

Work in 1961-62 was along the lines of previous years. However, much of the year was devoted to analysis of data from a number of investigations and to writing reports upon them. Major investigations done this year are summarised:—

Reproductive Performance in Well-Managed Herds.—The aim was to determine, for different aspects of the reproductive cycle, the levels achieved in well-managed commercial herds. The investigation commenced in 1958 and ended in October 1961. Data were collected in over 1,500 complete reproductive cycles within 20 herds. A great deal of information was obtained on length of anoestrum and oestral intervals, conception rates, culling rates, etc.

Clinical Observations on Reproduction.—The aim was to determine by clinical means the types of abnormalities that occur during various stages of the reproductive cycle. The investigation commenced in July, 1960, and ended in March, 1962. Observations were made on 198 cows. Information was gained on quiet ovulations, cystic ovarian disorders, embryonic death, etc.

Pathological Lesions in Cows' Genital Organs.—This project was to determine the type and incidence of pathological lesions in the genital organs of cows. It involved examination of about 330 sets of genital organs from slaughtered cattle. Lesions of different parts of the tract and of varying severity were found in 14 per cent of the specimens.

Oestrum Manifestations.—Occurrence of silent heats can be a major problem in bovine reproduction. An investigation was therefore done, to examine the signs of oestrum in dairy heifers. It revealed considerable variations between heifers in the intensity of oestrum, and that the detection of oestrum is influenced by various intra-herd factors.

Herd Infertility Survey.—The primary diagnosis made in 1961-62 in 34 herds with suspected infertility followed the normal pattern and were as follows, with the figures from 69 herds surveyed in 1960-61:—

	1961-62	1960-61
Vibriosis	14	20
Trichomoniasis	0	0
Brucellosis	4	9
Infertile Bulls	0	9
Non-specific Abortions	4	3
"Subfertility"	4	10
Fertility satisfactory	5	8
No Diagnosis	3	7
Miscellaneous	–	3
Totals	34	69

Quantities of Specimens Received.—By comparison with 1960-61, when there were special projects that involved large numbers of mucus and milk samples, the numbers of specimens handled at the Berry Infertility Laboratory were much less this year. The 1961-62 figures (with 1960-61 figures in brackets) were as follow: mucus samples 410 (1,032), blood 43 (124), milk 395 (958), breeding organs 49 (143), and miscellaneous 16 (35). Total 913 (2,292).

Dairy Cattle Nutrition Research, Wollongbar Station

Feed-year Production Trial.—Following the so-called "vetch grazing trial" which compared two systems of management of dairy cows (one incorporated vetch as "fodder") steps have been taken to introduce Subterranean clover and the summer legume *Glycine iavanica* into the improved farms' pasture cycle.

This year represented a transition phase. The additional species were established, and the management of the cattle was altered so that cows on the improved farm will calve in December-January (1962-63).

Recording of production in this trial will therefore commence as cows on the control farm calve, in July-August, 1962.

Results of the "vetch grazing trial" will be published shortly as *Utilization of sod-sown vetch by dairy cows on the far north coast of N.S.W.*

Supplementary Feeding, and Intra-herd "Social" Reactions.—Work with sheep had indicated that if 50 per cent of a flock were receiving a supplement of cereal grain and the others remained unsupplemented, the grazing behaviour and pasture intake of each were influenced by the presence of the other group of animals.

No published work indicates whether the same type of "social" inter-reactions may occur in herds of dairy cows wherein some cows received a supplement to the available pasture.

An experiment at Wollongbar Station in 1962 has indicated that milk production of cows receiving a supplement of concentrates may be increased by the presence of unsupplemented milking cows; this was by comparison with production of supplemented cows grazing alone. Statistical examination of the data is proceeding.

Vetch Supplement Trial.—An experiment has been initiated to compare the production of cows receiving vetch as a supplement to pasture at differing rates. Cows will receive a quantity of vetch that will provide about one-third, one-half and two-thirds of their theoretical daily dry-matter needs. The fencing and pasture sowings have been completed. The production phase will commence in August, 1962.

Pesticide Residues in Cattle from Grazing.—Dairy and beef cattle have been used in a trial to assess the residues of Dieldrin in tissues of cattle grazing pastures treated with this insecticide. The management phase of this experiment has been completed and samples of tissue collected, but results of chemical analysis of the samples for Dieldrin are awaited.

Digestibility of Pasture.—Studies to assess the digestibility of the proximate components of various pasture species likely to be met by grazing animals in this environment have been commenced, using wether sheep as the experimental animal. In 1961-62, twelve experiments were conducted. These involved Subterranean clover, Kikuyu grass, oats, vetch, *Glycine javanica* and *Dolichos lab lab.*

The digestibility of dry matter ranged from 59.6 per cent, for green leafy but muture *Glycine javanica,* to 79 per cent for good quality green oats just prior to and at "heading out".

Appetite Studies.—The work is attempting to assess the importance of various factors in regulating the voluntary intake of roughage by ruminants, particularly the effect of rate of digestion in the rumen-reticulum and subsequent rate of passage of digesta on intake.

One experiment studying the effect of protein supplementation of a low quality roughage was completed. It demonstrated that addition of linseed meal to an oaten straw ration resulted in a 50 per cent increase in intake of the roughage, associated with a similar increase in the rate of passage of digesta down the gastro intestinal tract (as measured by rate of passage of chromium oxide as an indigestible marker).

Beef Cattle Research, Leeton Station

Nutrition and Management Research

Beef Production per Acre Experiment.—The second full year of observations on cattle grazing the "farms" ended on 1st May, 1962. The 1961-62 production year results were similar to those of 1960-61.

Greatest production has been achieved at the highest rate of stocking, at the expense of quality; at the one beast per acre rate all carcases graded at first quality, whereas only two-thirds graded first quality at the two beast per acre rate.

Greatest financial return was from the heaviest stocking-rate but this was more than offset by the loss of four beasts from this "farm". Three deaths were recorded in the two beasts per acre lot, and one in the 1½ beasts per acre lot last year. They were diagnosed as due to bloat.

Growth rate over winter was again poor, although feed seemed abundant. In mid-summer, the beasts' growth rate levelled off. However, this year, better overall ultilisation of feed was achieved by moving the stock earlier from winter to summer pasture.

For the current 1962-63 experiment the weaners were introduced to the "farms" on 16th May, 1962. Steers and heifers from Group "K", ex Duck Creek (North Coast), have again been used and the 1961-drop Leeton-bred steer weaners have been incorporated. Thus there will be a useful comparison of the two groups' performances under strictly comparable conditions.

Pasture Silage Feeding of Beef

The value of pasture silage to beef cattle was studied; fed as a supplement to winter pasture, and also yard-fed as the sole feed.

The Paddock Grazing Studies.—This was at two stocking rates—1.5 and 1.9 steers per acre.

The experiment ran from 13th June, 1961, to 5th December, 1961, and all grazing groups gained about 2 lb. per day. There was no detectable difference in liveweight gain, carcase quality, or value.

The observations have confirmed the general findings of other workers, including the earlier work at Leeton Research Station, on hay supplementation of pasture. Namely, provision of extra feed to grazing stock generally amounts to *alternative* rather than *supplementary* feeding.

Probably there is a point between the two extremes (on the one hand, full pasture feeding and availability, and, on the other, gross overstocking, with loss of weight) whereat supplementation of pasture does increase production. The Leeton Station's 1961 experiment worked only within the upper levels of pasture availability.

In the current experiment there is a heavier stocking-rate, and a third stocking-rate would have been included if an additional area could have been allocated to this project.

The Yard-Feeding Studies.—These included three treatments:—full feeding of pasture silage; milled pasture hay; and chopped green pasture (zero grazing).

The silage fed cattle did not do as well as the hay and zero grazing groups. Dry-matter intake difference (12, 21 and 19 lb. per head per day, respectively, for yearling heifers) could have been the reason; due to poor palatability and/or high moisture content of the silage.

Early Weaning and Grain Supplementation of Calves.—Four treatments (combinations of weaned and non-weaned, and oat-grain supplemented and non-supplemented) were compared on 22 calves, of both sexes, in the 1961 drop. All calves were run together on pasture until about 126 days old. Then half were weaned. From 126 to 266 days old, half of each group was supplemented with 2 lb. of hammer-milled oats per head per day.

The following table summarises the results, as live-weight at 266 days:—

	Non-weaned	Weaned	Means
Non-supplemented ..	507	456	482
Supplemented	524	466	495
Means	516	461	

Calves early weaned at about 4½ months were 55 lb. lighter at 9 months. Bloom and finish were not greatly affected by early weaning, but these calves realised £5 per head less.

A grazier in a dry season, caught with limited fattening feed, should find early weaning worthwhile, particularly where calves are carried through for later sale or for breeding. Early weaned calves in previous experiments had compensated in their liveweight at two years.

In this experiment, grain supplementation gave only an extra 13 lb. weight, although in the previous year there was a significant 31 lb. increase.

Milk Production in Beef Cattle.—This study continued. Considerable variations between individuals, in absolute production and in lactation persistency, were apparent. The correlation between milk consumption and daily liveweight gain decreased as the calf got older, as would be expected. The following table expresses pounds of milk consumed per pound of liveweight gained:—

Period	Male	Female	Means
1-126 days	6.7	7.3	7.0
127-182 days	4.7	4.6	4.7
183-266 days	3.6	3.2	3.4
Total suckling	5.1	5.3	5.2

The implications are two-fold. Firstly, the findings are useful in interpreting the early-weaning results. Since the calf's nutritional need increases with age it is more and more dependent on pasture. Probably after four months, and certainly after six months of age, milk consumption does not greatly affect the calf's growth.

Secondly, when using calf-weight to assess mothering ability in beef cattle, these weights can be taken on the calves at younger ages. This could be applied in commercial beef cattle selection, and also by the stud breeder who wishes to supplement the calf during the latter stages of lactation.

Poor Growth and Fattening, on Irrigated Pasture.—This remains a problem; in fact, the growth rate of even the one beast per acre group in the "Production per Acre Experiment" was only 1.32 and 1.16 lb. per day in the 1960-61 and 1961-62 production year, respectively. However, satisfactory liveweight gains (2.0 lb. per day) recorded for the steers (Herefords) in the grazing areas of the "Silage Supplementation Experiment" confirm that good gains are possible; though these latter gains are for six months only.

Among the factors considered as possibly causing unsatisfactory liveweight gain are:—

Cobalt Deficiency (?).—Three experiments were undertaken. These involved: yearling Angus steers in the "Production per Acre Experiment"; yearling Hereford steers in the "Silage Supplementation Experiment"; and Leeton-bred yearling Angus heifers from the 1960 drop. The only response was in the latter; the cobalt-treated group gained an extra 21 lb. over six months. That difference is probably not significant. Further, the vitamin B12 levels in the blood sera taken at time of treatment were within normal limits and did not indicate cobalt deficiency. This analysis was undertaken in Adelaide by the C.S.I.R.O.

Internal Parasites (?).—As in 1960-61, regular fecal-sampling of steers in the "Production per Acre Experiment" failed to reveal significant parasitic burden. However, at slaughtering it was found they had suffered ostertagiosis and oesophagostomiasis. (Anthelmintic efficiency of six drugs was tested in co-operation with the Veterinary Research Station.)

Pasture Quality (?).—Pasture-intake studies await the appointment of an additional research officer.

Beef Breeding Research

There is urgent need in Australia for more effective evaluation and selection of beef breeding-stock than is possible by the general "selection on conformation".

Selection by Production Factors.—This Department in 1956 started work (Agricultural Extension Grant Project No. 108) that has shown significant improvement can be made by selection, for herd improvement, on other important production factors such as weight-for-age and milking or mothering ability.

Bulls gaining ½ lb. per day faster than their mates have sired progeny which were 30 lb. heavier as yearlings; this would be worth an extra £2 per steer.

Selection of cows on weaning-weight and conformation-grade of calf has increased overall weight by 15 lb. in three years, besides continued improvement in conformation.

Aids to calculation for men in the industry have been developed, such as the rotary age-calculator and nomograph, to adjust weaning weight to a standard age. These will increase the rate of application of selection procedures in the industry; helped by widespread demonstrations. Under the Agricultural Extension Grant there are already six demonstrations.

Selection for Eyelid Pigmentation.—Bovine ocular squamous carcinoma ("Cancer Eye") causes considerable economic wastage in Hereford cattle. Observations have revealed a strong negative correlation between degree of eyelid pigmentation and incidence of both precursor lesions and of confirmed squamous carcinoma. Heavy eyelid pigmentation was associated with lower incidence of lesions on the eyeball as well as on the eyelid. This is contrary to overseas reports, but supports work done by the C.S.I.R.O. at Rockhampton, Queensland.

This has particular interest because it is the first time that selection for eyelid pigmentation has been shown to be important in non-tropical Australia.

Synchronisation of Oestrus in Beef Cattle.—Controlled breeding and artificial insemination of beef cattle would be valuable aids to herd improvement; and to reduce the spread of calving to ensure more uniform experimental groups of calves.

Two experiments were undertaken in 1961, using progesterone and PMS, following expression of corpora lutea, to synchronise oestrus. Only 10 per cent of cows conceived to artificial insemination following these treatments. The treatment did not adversely affect fertility when cows were subsequently joined to the bull.

Pig Research; Veterinary Station, Glenfield

Swine Fever Research

The Swine Fever outbreak initially confirmed in May, 1961, has continued throughout 1961-62, and much of the associated work at Glenfield Veterinary Research Station has been towards better diagnostic methods and towards early eradication of the disease from this State.

Mortalities in over 1,000 piggeries have been investigated this year, and the disease has been confirmed on 100 properties. The volume of pig material received at the Station has exceeded that of any previous year. Many of the professional and assistant staff have been fully occupied in the histopathological, bacteriological, serological and biochemical work and the twenty isolation animal-houses have been continually occupied for transmission and challenge tests.

Histopathological Examination of the Pigs' Central Nervous System.—In all cases, brain histopathology has been used to select those piggeries for more intensive laboratory work. Acquisition of an electric tissue-processor has kept the histological preparations up to date, and over 1,000 pigs brains have been examined.

Extensive or limited lesions consistent with Swine Fever were recognised in 48 per cent of brains from properties where the disease was subsequently confirmed. Lesions were found in 13 per cent of pigs on properties where the disease has not yet been confirmed.

Of 1,002 brains examined, 5 per cent showed extensive typical lesions of Swine Fever, 7.8 per cent were suspicious for Swine Fever, 0.7 per cent were indicative of Salt Poisoning, and in 6.2 per cent there was encephalitis and/or meningitis of probable bacterial origin.

Serum-Neutralization Tissue-Culture Tests.—This test, initially described by workers at Cornell University, U.S.A., is being closely examined at the Parkville C.S.I.R.O. Laboratory. Towards the close of the year it was showing distinct promise. Close liaison is maintained with progress of the Parkville work, and assistance is given by passaging the Cornell strain of virus through pigs for enhanced virus content.

This diagnostic method will have two major advantages over present methods now used at Glenfield—it is a self-contained test, and it is likely to be more specific for Swine Fever.

Gel-Diffusion Precipitin Tests.—In view of recognised need to develop some laboratory test for diagnosis of the current low-virulent disease, every effort has been made to improve the gel precipitin test for practical application.

The test at present in use involves antigen prepared from the pancreas of a pig infected with virulent Swine Fever virus. It shows particular promise and is being compared with the results of challenging the same pigs with virulent virus. The progress results, for 380 pigs, are tabulated:—

Gel Precipitin Tests	Results of Challenge with Virulent Virus	
	Survived	Died
Positive 78	71	7*
Doubtful 16	14	2*
Negative 286	29	257*

(* Swine Fever otherwise confirmed on these herds.)

In other words, on a herd basis there has been no false positive to the gel test but about 8 per cent false negatives. The false negatives have varied widely as between herds. They do influence the number of pigs to be sampled in any one infected herd to ensure that infected pigs are detected.

Greatest difficulty with the gel test at present is supply of antigen. Not all pigs infected with virulent virus will produce a pancreas with sufficient precipitating antigen to use in the test. With the present technique, antigen can be demonstrated in 10-20 per cent of pigs which succumb from virulent virus infection, but in only 5-10 per cent is it sufficiently strong to be used in the test as a reference antigen.

A research officer who has been responsible for development of the test to the present stage has proceeded to the United Kingdom and is now studying various aspects of antigen production with workers at the Weybridge laboratories.

The recent demonstration (by Weybridge workers) of cross reactions in the gel-test, between Swine Fever and the Mucosal Disease-Virus Diarrhoea complex, and the presence of precipating antibodies in some bovine sera in N.S.W., raised other problems. These are in connection with the specificity of the current gel-test technique for Swine Fever diagnosis.

Pancreatic and Serum Amylase Tests.—This test is not specific for Swine Fever but it was thought that it could be important in screening pig mortalities or pig populations, to select some for more intense studies. However, Glenfield results have shown that although the test works satisfactorily with virulent Swine Fever infection, it is not consistent when the disease is caused by the low virulent virus. The serum amylase test is apparently not a valuable diagnostic method for either virulent or "low virulent" disease.

Transmission and Challenge Tests.—At the outset, the final method to confirm a Swine Fever diagnosis was by transmission, using a bacteria-free filtrate, and, as very few pigs died with this "low virulent" virus, by challenging them with virulent virus 21 days later to prove their immunity.

This was a slow method. There was a five-six weeks delay in arriving at a diagnosis. It would not cope with the volume of material reaching the laboratory. So, the method was modified by transferring recovered pigs or contact pigs from the suspect property direct to the laboratory and challenging these field cases with virulent virus to detect their immune status.

With the modified method great reliance has to be placed on selection of the correct individual animals and, hence, on the pig owner. To help selection of pigs for transfer to the laboratory and subsequent challenge the gel precipitin test has been used. Only those reacting to the test have been challenged.

In the twelve months some 500 pigs have been brought to the laboratory from suspect properties and another 100 pigs from a herd (Hawkesbury College) known to be free of Swine Fever have been used either for control pigs for the various challenge tests or for transmission and experimental work.

The standard challenge dose was 1 ml. of freeze-dried infective blood-dilutes, 1 in 1,000 with 0. Broth. For more recent tests the challenge dose has been 1 ml. of frozen infected blood diluted 1 in 10,000 with 0. Broth. Some 3 per cent of presumed susceptible pigs survived the standard challenge dose of virulent virus, though in each case they had shown a temperature rise and other signs of Swine Fever before final recovery. The results of the challenge tests of the pigs over the greatest part of this period have been summarised in the following tabulation:—

Result of Pigs Challenged with Virulent Virus

13th May, 1961 to 30th April, 1962

	Totals	Susceptible, Died	Resistant, Survived	Atypical, Survived
Normal, Control Pigs (ex H.A. College)	50	47	0	3
Following Transmission (Pigs ex H. A. College)	48	40	8	0
Suspected Field Recoveries or From Suspect Properties ..	478	296	Survived 182	
Totals	576	383	Survived 193	

Viability of Virus in Canned Hams and Sausage Casings.—Ham was prepared from a pig experimentally infected with virulent Swine Fever. The meat was packed in 1 lb. tins. These tins were divided into four groups. One group received no further treatment. Each of the other three groups was heated at 180°C. for 50, 75 and 100 minutes, under conditions similar to a commercial process. Feeding trials were conducted on pigs free of Swine Fever, using the foregoing tinned meat.

None of the pigs fed any of the cooked ham died from Swine Fever or developed any immunity to final challenge tests with virulent virus. The uncooked meat was found to be capable of infecting a pig with Swine Fever 85 days after canning. Stocks of tinned ham were exhausted by then. A further extended feeding trial may be undertaken.

Sausage casings were prepared from a pig infected with virulent Swine Fever. Four ounces of this material failed to infect, or immunise, a pig fed on the day processing was completed. Four ounces of washed unprocessed bowel, from the same source as that used for the casing, caused death from Swine Fever when fed to a susceptible pig. This work may be repeated, on a greater number of pigs, modifying the process for casing preparation, and using different routes to introduce the suspect material into the animals.

Other Swine Diseases

Infectious (Inclusion Body) Rhinitis of Pigs.—No further research has been done on it. It is now accepted as a routine diagnostic problem. The condition is still widespread; not important in well-managed piggeries, but significant in herds where other diseases or poor husbandry are factors.

Toxic Jaundice of Swine.—Ingestion of Paterson's Curse (*Echium plantagineum*) is the suspected cause in pigs up to six months old in the winter-spring period.

An inconclusive feeding trial with the dehydrated plant was done at Wagga College. The work will be done on a more extensive scale later, and will test the plant at different growth stages.

Pig Nutrition Research—Wollongbar Station

Effects of Varied Milk to Grain Ratios.—Work has revolved around the experiment studying the effect of feeding different ratios of separated milk and grain at different rates, on growth rate, food conversion efficiency and carcase quality.

In 1961-62, two batches of pigs (16 in each) have been carried through, one batch to bacon weights and one batch to pork weights. The following trends are report-worthy at this stage:—

(i) Gains per day are always greater with the rations that contained milk, compared to all-meal rations fed at the same rate.

(ii) Rate of gain progressively increases as rate of feeding increases from 2 per cent of body weight to 5 per cent. This is particularly marked in the 60-100 lb. liveweight range, but differences are not so apparent between 100-160 lb. liveweight.

(iii) Despite much slower rate of growth on low rates of feeding, feed-conversion efficiencies are very similar between treatments varying the rate from 2 per cent to 5 per cent of body weight.

(iv) There are indications that an all-milk ration produces rates of gain and feed-conversion efficiencies that are little better than those of all-meal rations fed at the same rate.

(v) Carcase evaluation has indicated that treatments allowing rates of feeding at 3.0 or 3.5 per cent of bodyweight, with most of the intake as milk, produce carcases approaching the bacon trade's needs.

(vi) Protein level *per se* is not the only factor affecting carcase quality. Daily protein-intakes much higher than generally recommended may produce poor-quality carcases.

Carcase Dissection.—As part of the overall study of pigs' utilization of milk and grain, complete carcase dissections into fat, muscle and bone are being done for a more precise estimate of the effect of feeding treatments on carcase quality than by the Hammond and Downey appraisal systems. The opportunity is being taken to relate the figures, obtained in dissections, to the carcase "score" as given by the Hammond and Downey systems.

Meter Assessment of Fat Deposition in the Live Pig.—It has been suggested in the literature that deposition of fatty tissue in the live animal can be measured by an instrument which depends on the differential rate of electrical conductivity of fat and meat tissue (e.g., the Duncan "Leanmeter"). The Wollongbar Station's work would be assisted if the depth of back fat in pigs could be accurately assessed at different stages of growth. A "Leanmeter" has been loaned by New England University and is being tested to ascertain the accuracy with which back fat can be measured in the live pig.

Poultry Research—Veterinary Station, Glenfield

Poultry Diseases

Respiratory Conditions.—A survey of aetiological factors in avian respiratory diseases has been commenced. The adopted procedure for differential diagnosis will allow better differentiation of the recognised local aetiological factors. It will also permit recognition of exotic respiratory infections such as Infectious Bronchitis and Newcastle Disease.

Agents isolated so far are the viruses of Infectious Laryngotracheitis and Fowl Pox; *Haemophilus gallinarum, Pasteurella multacida, P. haemolytica,* and *Mycoplasma gallisepticum* (not previously known in Australia).

The Fahey-Crawley virus is recognised overseas as an agent involved in the respiratory disease complex, and one similar to it has been isolated from several cases of respiratory disease here.

Infectious-Laryngotracheitis Vaccine.—The work reported last year has led to initiation of trials with an avirulent virus, isolated in South Australia in 1953.

Virulence of this organism will be compared with that of other recognised strains. Then a trial to measure the immunogenic properties of the avirulent virus when administered in two concentrations to the conjunctira, tracheal mucosa membrane, and cloacal mucous membrane will be done. The vaccinated birds will be challenged with virulent virus eight weeks after vaccination. The effect of varying doses of virus will be estimated and the duration of immunity measured.

If avirulent virus is found satisfactory its use in preparation of a field vaccine will be considered.

Avian Monocytosis.—Incidence further decreased as in the previous year, when there was a sharp drop in number of reported cases and less morbidity. Seemingly the disease is losing its aggressiveness, in terms of frequency and of pathogenicity, and at present is not a serious problem.

Another marked feature is reversion of the clinical and pathological picture to the classical form of "pullet disease". The main effect is on older birds—less egg production and not much mortality. This contrasts with 1960-61 experience; when mostly young chickens were affected, and with high

mortality. Improvement of commercial poultry rations, and more widespread preventative treatment of flocks with molasses or potassium citrate, could be responsible for the change.

The tests of the hypothesis of a toxic factor produced during heat treatment of meat or liver meals in industrial preparation, as the cause of Avian Monocytosis, have ended. The results were negative. The experiments were very comprehensive, but no evidence was obtained to support the hypothesis that toxic fractions in meat meals were the cause of Avian Monocytosis.

Encephalitic Syndrome in Ducklings (Virus).—No further case has been observed. So only the experiments from the last year were continued. The original virus culture had become fungus-contaminated. It was purified by colodion filtration. Many unsuccessful attempts to sterilise it with Mycostatin had been made.

New virus culture has been obtained after seven passages in chicken CAM. Rich suspensions of pure virus are now held pending further experiments on the condition.

Encephalitic Syndrome in Turkeys (Virus).—Recently a new disease association was observed in turkeys; with pronounced body shivering and wing tremor. Virus infection was suspected. After five passages through CAM of embryonated chicken eggs, a virus was isolated from turkey brains. The pure virus was multiplied through further passages. It has been stored for further experiments aimed at identification of the agent and its association with the disease.

New Diseases Observed During the Year.—In the poultry diagnostic section the new diseases observed included: encephalitic syndrome in turkeys, *Epidermoptes bilobatos* in fowls, Aspecific dermatitis in ducks (suspected mycosis), and Trichomoniasis in ducklings.

Poultry Research; Seven Hills Station

Improved Facilities

Provision for Nutrition Research Laboratory.—The need to commence a large-scale research programme on quality of animal protein concentrates in poultry diets was brought to the attention of the manufacturers. Financial aid for erection of a nutrition research laboratory designed to stabilize environmental effects was proposed and accepted. Plans for the building have been finalised. Construction will proceed shortly. An analyst to assist in the research programme has been provided for and selected.

New Housing of Breeding Programmes.—Stock in the two breeding programmes at this Station were housed in new buildings for the first time this year. The improved facilities have resulted in a general increase in accuracy of data collected and allowed more birds to be tested.

Genetics and Poultry Breeding Research

Poultry Breeding Programme (Eggs).—The third generation in this breeding programme was selected. Three flocks are maintained and selected independently on the basis of egg production, egg size, and shell thickness. An individual selection index is obtained, being based on joint, individual and family records. The experiment has now reached its planned size, through improved facilities. It is proposed to study a biochemical characteristic under genetic control in the next generation.

Poultry Breeding Programme (Meat).—The breeding programme includes two flocks. One flock has been under selection for some time; the criterion is five weeks' body weight. Inbreeding has risen above a satisfactory level. New genetic material will be introduced in the next generation.

The second flock has been selected for three generations from an originally diverse genetic pool. Body weight at ten weeks, and rate of feather growth, are the selection criteria. Examination of the effects of rate of feather growth and rate of production of the substrates required for feather growth, on rate of gain, is in the programme; together with examination of the effect of efficiency of feed utilization on rate of body growth.

Poultry Nutrition Research

Sodium Requirements of Laying Hens.—It has been established that level of sodium-intake of laying hens not only affects production but markedly influences egg size. Suboptimum levels of dietary sodium decreased egg production and reduced egg-size of mature birds; whilst in immature birds the effect was interruption of the process of increases in egg weight typical of a bird progressing to maturity. A precise estimate of the sodium requirement has been obtained and a practical range has been suggested.

Sodium Requirements of Growing Chickens.—The level of sodium-intake needed to maintain normal growth has been examined, using a low sodium diet, based on soybean oil meal. Below-optimum levels of dietary sodium decreased chicken growth rate by about 30 per cent. Efficiency of feed utilization was similarly decreased.

Adrenal gland activity was also markedly influenced by level of sodium intake. A deficiency and also an excess of dietary sodium led to bigger adrenel glands. Possibly the bird attempts to maintain a normal body-sodium balance. Birds receiving excessive levels of sodium would thereby be in a state of stress, which may be associated with types of kidney failure.

Breeding Diets—The Vitamin B Group and Vitamin E.—Previous data obtained at this Station demonstrated that supplements of riboflavin and manganese could maintain egg production and hatching performance in diets that excluded mill offals. Recent experiments have indicated that addition of a complex mixture of the B group of vitamins and Vitamin E can increase the percentage of chickens hatched and improve the general growth of those chickens. Experiments in progress aim to determine whether this effect is due to increased Vitamin E levels in the breeding diet or to a member, or a combination of the members, of the B complex group.

Sorghum as a Replacement Grain in Chicken Rations.—Both sorghum grain quality and the possible toxic effects of high levels of sorghum grain in chicken rations have been examined. The experiments did not confirm an earlier report from this station that certain samples of sorghum grain may be toxic, but large variations in quality were observed.

Both variety and the place where the grain was produced affected sorghum quality. Some poor quality samples were isolated but could not be considered toxic. The situation will be re-examined and an attempt made to isolate or re-demonstrate the presence of toxic samples.

Status of Vitamin B6 in Practical Chicken Rations.—Growth increase due to supplements of Vitamin B6 in practical diets which apparently contained more than the normal requirement of this vitamin has been consistently demonstrated. Addition of linseed oil meal to a ration increases the Vitamin B6 requirement, by virtue of the presence of a specific substance antagonistic to Vitamin B6. However, in the absence of linseed oil meal, there is still a growth response.

Preliminary experiments suggest the effect of supplementary Vitamin B6 is through increased amino acid utilization, but the possibility that the accepted Vitamin B6 requirement of the chicken is inaccurate will also be investigated.

Arsonic Acid, Vitamin E and Selenium.—Leg weakness, together with an occasional depression in growth rate, have been observed in chickens fed diets containing the medicant Arsonic acid.

Addition of Vitamin E or selenium to the diet containing Arsonic acid interrupted the growth depression, but effect on leg weakness could not be measured. It is suspected that the selenium level of the diet used was marginal, due to fluctuation of selenium level in the wheat included (the addition of arsonic acid therefore lowering the available selenium and affecting growth rate).

The Livestock Husbandry and Advisory Sections of Division of Animal Industry

These Sections, each controlled by a categorised Principal Livestock Officer, are the Sheep and Wool Section, Beef Cattle, Horses and Goats Section, Pig Section, Poultry Section, and Apiculture Section.

They provide the categorised District livestock officers for extension services and the Experiment Farms', Experiment Stations', Research Stations', Agricultural Colleges' livestock officers for husbandry of the Department's studs, herds, flocks.

The Sheep and Wool Section

Staff.—Establishment strength of the Section has been increased by one new appointment to a total of 34 Officers—the Principal and a Special livestock officer (sheep and wool) in head office, 19 District livestock officers (sheep and wool) and 13 at Experiment Farms, Stations and Colleges. There are two vacancies.

The Public Service Board has approved establishment of three new District positions, at Albury, Mudgee, and Warren, but funds so far have been provided for one of them, viz., Warren. Except for Warren, all District positions are occupied.

Services in the Glen Innes, Berrigan, Leeton and Cooma Districts have been interrupted by three resignations and an unavoidable transfer. Continued loss of officers, particularly in the first three years after joining, has made it impossible to maintain at institutions a pool of sufficiently trained officers for District appointments.

Sheep and Wool Extension Services

Inter-year Comparison of the Major Extension Activities.—The volume of work done by the District officers was comparable to other recent years. The break in staffing the districts of Glen Innes, Leeton, Berrigan, and Cooma, affected the figures. Officers attended more schools and courses than other years as participants or as lecturers.

	1960–61	1961–62	Percentage Increase or Decrease
Number of property visits	2,460	2,810	+ 14
Number of sheep selected	351,338	391,646	+ 11
Number of flock ewes fleece weighed	..	57,062	..
Value of sheep selected and purchased	£70,365	£80,298	+ 13
Lectures, demonstrations and field days	367	331	— 9
Ram sales, Agricultural Shows, etc.	175	116	— 33
Radio broadcasts, publicity statements	536	529	— 1
Competitions serviced	36	41	+ 13
Field Investigation projects	3	19	+ 533

Field Investigation Projects System.—This, started in 1961 by the District Sheep and wool officers, in association with the research staff of Trangie Agricultural Research Station, has made good progress. An example is provided by the outstanding field day held on Havilah and Lue Stations in the Mudgee district to demonstrate results of the current projects on these properties. There are 18 similar projects throughout the State.

Fleece-Weighing as Flock Selection Aid.—Selection of flock sheep by greasy fleece weight was actively promoted. Help and direction in the weighing of about 57,000 fleeces for selection of Merino sheep were given by District officers.

Poll Merino Breeders' Convention at Trangie.—Through the Poll Merino Breeders' Association of Australia, a Convention was organised at Trangie Agricultural Research Station. Attendance was by invitation; 50 breeders attended, from Queensland, Victoria and South Australia as well as New South Wales.

Merino Ewe Competition.—The Competition has proved to be a successful means of introducing improved methods of management and sheep selection to the Merino industry, through use of specialised speakers at field days on competing properties.

Lamb Breeders' Ewe Competition.—The competion in 1962-63 will be the last under the present conditions. It may be replaced by a Fertility Competition, for which the conditions are being drafted.

District Competitions.—District livestock officers (sheep and wool) conducted a number of local competitions, Merino ewe competitions, hogget competitions and carcase competitions.

Junior Farmer Club Work.—Assistance was given to the Junior Farmer movement, of the Department of Education, by project judgings, lectures, and demonstrations.

In-service Training.—Four sheep and wool officers attended the Department's Extension Methods School, Newport; six attended the Commonwealth Sheep and Wool Extension Officers' Refresher Course; five attended the Department's Farm Management Course; and all sheep and wool officers attended the annual Branch Seminar (four days), held at Wagga Agricultural College.

Other special in-service training opportunities were given to individual officers, by allocation to appropriate projects for periods.

Sheep Industry Production Trends

Change in outlook of producers towards new ideas of management is very noticeable. Breeders are more co-operative and willing to undertake investigational work. The general economic position of the industry, the apparent benefits derived from introduction of spring lambing and other recommended management changes account for the increasing susceptibility to new ideas. Spring lambing is now established and, as a consequence, a change to autumn shearing is being adopted by many producers.

A new concept of stock and pastoral management is in process of gradual adoption. Information requests are now based more on practical management as a complete unit than on specific questions about a specific section or problem.

Areas sown to wheat have markedly increased without reduction in number of sheep carried. This may indicate that rate of stocking can be increased, but if a dry spell sets in a reduction in sheep numbers will be necessary.

Sheep Projects at Departmental Institutions

At 30th June, 1962, there were 20,612 sheep on Department of Agriculture institutions.

Condobolin Experiment Farm Projects.—There are 2,435 sheep here. Current sheep projects are:—

(i) *Fixation of Border Leicester x Merino*: Merino ewes for the formation of this trial have now been disposed of by sale. The flock now comprises sheep bred and selected on the Farm. The ewes have been separated into two flocks. One flock will be mated in the spring and the other in the autumn.

(ii) *A Flushing Trial*: Using the Merino ewes from the drought recovery flock. These ewes were transferred to Condobolin from Glenfield Veterinary Research Station after use for drought feeding studies at that centre.

(iii) *An Early Weaning Trial*: Done with the lambs from the Flushing Trials ewes, and to be done also on lambs in the present lambing.

Cowra Experiment Farm Projects.—There are 1,883 sheep here. The work in progress consists of:—

(i) *The Breed Comparison Study*: Border Leicester x Merino; Romney Marsh x Merino; and Corriedale ewes; mated to Dorset Horn and South Down rams. This trial will end in 1963.

(ii) *A Time of Lambing Trial*: Three groups, mated in (*a*) autumn, (*b*) spring, (*c*) autumn and spring.

(iii) *A Rate of Stocking Trial*: Four rates of stocking, (*a*) one sheep, (*b*) two sheep, (*c*) three sheep, (*d*) four sheep, per acre. Now in its second year this trial has given excellent results. It may now be extended to a larger and more comprehensive scale.

(iv) *A Hybrid Vigour Trial*: The pure bred Border Leicester flock now comprises 100 ewes and the trial will commence in 1963.

Grafton Experiment Farm.—There are now no sheep here. The lamb-raising trial has ended and the ewes have been sold. The work proved that lamb-raising in this environment is not economic. The results have been written up and await publication in the *Agricultural Gazette*.

To take advantage of the facilities for running sheep that now exist at Grafton, Merino, Corriedale and Polwarth wethers will be introduced, to study the problems of wool-growing in this coastal environment.

Glen Innes Agricultural Research Station Projects.—Present sheep numbers are 1,275. The experiments comprise:—

(i) *A Breed Comparison Trial*: Border Leicester x Merino ewes and Dorset Horn x Merino ewes, mated to Dorset Horn rams. The trial will end in 1963.

(ii) *A Time of Lambing Trial*: Border Leicester x Merino ewes and Dorset Horn x Corriedale ewes, mated to Dorset Horn rams.

(iii) *A Breed Comparison Trial*: Dorset Horn rams and Cheviot rams mated to Border Leicester x Merino ewes. This trial started in 1961 and is being repeated.

Leeton Experiment Farm Projects: Present sheep numbers are 3,818. The projects are:—

(i) Seasonal variations and reproduction of Border Leicester x Merino ewes.

(ii) A production per acre experiment.

(iii) The effect of nutrition and shearing on reproduction of Border Leicester x Merino ewes.

(iv) A comparison of Merino ewes (Peppin strain) and Border Leicester x Merino ewes as dams for lamb production.

Shannon Vale Nutrition Station.—Present sheep numbers are 2,675. The only current work is a High Stocking Rate Trial, using 10 wethers per acre.

Capital expenditure from monies provided by the Wool Research Trust Fund has recently been made at the Station, to develop it as a comprehensive research site.

Tamworth Agricultural Research Station Projects.—Present sheep numbers are 545. The projects comprise:—

(i) Border Leicester x Merino ewes selected for polledness and mated to Dorset Horn rams; to study the influence of the poll gene on the growth rate of lambs.

(ii) Four different ram-marking techniques.

These trials, carried out in 1960-61, will be repeated in 1962-63.

Temora Experiment Farm Projects.—Present sheep numbers are 1,768. The projects comprise:—

(i) *A Corriedale vs Polwarth Breed Comparison Trial*: The mating of these flocks has been changed from spring to autumn. This requires a change in general management, and shearing will now be carried out in February instead of August. The trial will be extended in 1963, by adding 100 Peppin Merino ewes and 100 South Australian Merino ewes.

(ii) *The Pen Feeding Trial*: It is run in conjunction with the Corriedale vs. Polwarth Comparative Trial. This year it comprised ad-lib. feeding to establish the efficiency of feed conversion for each breed. These trials are short, lasting only twelve to sixteen weeks.

(iii) *Poll Dorset Stud*: This year two Stud Poll Dorset Rams were bought, to overcome the occurring inbreeding problem. Sales of rams this year have been satisfactory. The stud is in high regard in the industry. Stud rams bred at Temora are in demand.

Trangie Agricultural Research Station.—Present sheep numbers are 5,154. All sheep at Trangie are Merinos. They are used in sheep breeding projects which have been reported on by the special research staff located at Trangie. (See earlier section of this Division of Animal Industry Report.)

Yanco Agricultural Research Station Projects.—Present sheep numbers are 739. The projects comprise:—

(i) A flock of 800 Merino ewes established for the breeding of Border Leicester x Merino ewes for use at Leeton Experiment Farm. The first draft of ewes bred from this flock have been transferred to Leeton Experiment Farm.

(ii) *Breed Comparison Trials*: Border Leicester x Merino, Romey Marsh x Merino, and Corriedale ewes, mated with Dorset Horn Rams. The ewes in this trial are now seven years old. The trial will end in 1963.

Wollongbar Agricutulral Research Station.—There are 29 sheep here. They are used in silage digestibility research.

Narrabri Experiment Farm.—There are 290 crossbred wethers which are used as scavengers. No research is done.

The Beef Cattle, Horses, and Goats Section

Extension Staff.—Three Agricultural Regions (Western, North-Western, and North Coast) have a District livestock officer (beef cattle) at the respective headquarters; each also provides some service to an adjacent Region. Staff strength has been increased by one to enable an appointment also to Mid Coast and Hunter Region. Also, this year the livestock officer (beef cattle) at Wagga Agricultural College undertook part-time district work in the Southern Agricultural Region.

Beef Cattle Schools.—Two Beef Cattle Schools were held—a four days school at Muswellbrook and Molong respectively. Both were well attended and well received.

Beef Cattle Breeders Competition.—For the tenth successive year this competition was sponsored by the Agricultural Bureau of N.S.W., the Rural Bank of N.S.W. and this Department. A record entry of 267 was received. This competition has been unusual for the extent of increased interest each year since it started ten years ago. It continues to contribute a lot to the effectiveness of extension service in beef cattle raising, especially through field days on the competing properties.

Investigational Work.—Leeton Agricultural Research Station is a centre of Departmental work with beef cattle conducted by a Special Veterinary Officer (Research). Collaboration is close.

Projects in progress include:—Production Per Acre; Early Weaning of Calves; Effect of Hormones on Growth of Young Cattle; Values of Chopped Hay, Milled Hay, Silage and Chopped Pasture for Growing Cattle; Hay Supplementation of Succulent Pastures; Hair Shedding and Teething in Relation to Growth; Effects of Internal Parasitism, and Control Measures; and Induced Oestrus in Breeding Cows.

The "Improvement of Beef Cattle" Project (Agricultural Extension Grant Project 108) established in 1956 on two properties at Bombala has been expanded. It is now conducted on seven private properties. The principles applied in this project are also being applied in beef cattle herds owned by the Department.

The Department is co-operating with the Bureau of Agricultural Economics, Canberra, in a survey of the economics of use of *Sorghum almum* to fatten beef cattle in the north-west of N.S.W. Collection of data relating to this survey commenced recently.

Stud Beef Cattle.—The stud beef cattle numbers increased from 492 to 572 head.

A set of six bull yards and a new cattle barn have been built at Trangie Agricultural Research Station. This is the first major reconstruction project at the Trangie beef cattle section since the first structures in 1929 when the Angus stud was established there.

Competitive Exhibits.—Eight Angus bulls from Trangie Agricultural Research Station were exhibited at the 1962 Sydnew Royal Show. Five of them were sold by public auction at the Show.

Three Poll Shorthorn bulls from Wagga Agricultural College were also exhibited at the Show. Two were sold by private treaty at the Showgrounds.

Commercial Beef Cattle.—These, kept mainly for ration beef at Departmental institutions, increased by 57 head. The numbers of commercial cattle are now such that it is possible to dispose of those of dairy breeds and supply the two Agricultural Colleges with straight-bred or crossbred beef types for rations.

Horses.—On 31st May, 1962, the Department owned 231 horses, five less than a year ago.

Privately owned mares were accepted for service by the Departmental studs at Hawkesbury and Wagga Agricultural Colleges—31 at H.A.C. and nine at W.A.C.

The Department exhibited 10 Arab horses at the 1962 Sydney Royal Show, five each (a stallion and four females) from Hawkesbury and Wagga Agricultural Colleges. The exhibits gained one Championship, two 1st prizes, two 2nd prizes and two 3rd prizes. The mare Thalia from Hawkesbury Agricultural College won the Lady Wentworth Memorial Trophy (equivalent to Grand Champion Female) for the third time.

Saanen Goats.—Breeding of Saanen goats at Condobolin Agricultural Research Station has ceased. The stud was dispersed by public auction at the Station on 8th March, 1962. A complete clearance was effected; 121 stud goats were sold for a total of 2,948 guineas and 26 rugs fetched £44 10s. 0d.

The Pig Section

Industry Trends.—A sustained high level of pig meats production caused pig prices to remain low. Quarantine restrictions arising from the swine fever outbreak further aggravated the marketing difficulties. As results, many marginal pig-raisers ceased production and regular producers reduced their herds.

Arising from Swine Compensation Act.—Seventy-nine pig herds condemned for Swine Fever were valued by livestock officers for purposes of compensation and help was given in the preparation and examination of hundreds of claims on pigs ordered for slaughter as suspects. Compensations rapidly depleted the Swine Compensation Fund, and the Swine Tax rate was increased from 6d. to 2s.

Arising from Swine Branding Act.—An intensive check-branding campaign was undertaken. Thousands of pigs were branded at sales yards to assist in identifying farms of origin, and to improve the Act's implementation. Court proceedings were needed in some cases and succeeded.

Extension (and Regulatory) Services.—The activities of livestock officers (pigs) are summarised in the following table, with the two preceding years for comparisons:—

	1959–60	1960–61	1961–62
Farms visited	1,397	1,471	1,299
Meetings attended	62	85	63
Pig Sales attended	139	147	242
Field days attended ..	61	51	35
Bacon factories visited	79	97	199
Experiment farms visited	147	131	106
Shows attended	26	29	17
Lectures and demonstrations given	108	148	72
Radio broadcasts	75	93	60
Swine Branding Act (1940) inspections	30	37	247
Herd valuations	—	—	79
Stock Foods and Medicines Act (1940) inspections	—	—	13

In addition there was a steady stream of requests for advice on all phases of pig raising. These were dealt with in personal interviews and by letter and telephone.

Printed pamphlets on breeding, housing, management and marketing of pigs were also widely distributed. Daily and weekly newspapers were supplied with numerous press releases and articles were published in the *Land Annual* and the *Agricultural Gazette of N.S.W.*

The staff situation remained as in 1960-61. There are twelve livestock officers—the Principal, five Seniors and six others and a vacant position.

Services to Other Departments, etc.—Technical advice on management of pig herds at institutions controlled by the Departments of Prisons, Health, Education and Child Welfare, was given and breeding stock was supplied.

Correspondence-teaching, part-time teaching, and examiner services were provided for the Department of Technical Education. A relieving lecturer and examiner was also provided for the University of Sydney.

Services of the livestock officers (pigs) were called upon by farmers' organisations, Junior Farmers' Clubs, the Australian Pig Society, the N.S.W. Royal Agriculture Society, country Agricultural Show Societies, the Australian Meat Board, the Rural Bank of N.S.W., and the Commonwealth Development Bank.

The Department's Herds.—Large White, Berkshire, Landrace and Tamworth herds were maintained at the Hawkesbury, Wagga, Wollongbar and Grafton institutions. At Hawkesbury and Wagga the herds were mainly for student instruction and rations. Hawkesbury also provided 109 pigs for development of Swine Fever testing, by the veterinary research sevices. The herds at Wollongbar and Grafton were used for nutrition research.

Dispersals comprised 877 pigs. Sales of stud stock virtually ceased, reflecting the effect of Swine Fever in the industry:—

	1959-61	1960-61	1961-62
Stud pigs sold	190	64	8
Market pigs sold	416	414	423
Pigs killed for food ...	298	401	319
Pigs killed for research	—	—	127
Total pigs disposed of	904	879	877
Approximate value	£13,000	£10,000	£7,000

Competitive Exhibits.—Prize-winning entries were made from the Wagga and Grafton herds, in State-wide and local pig-carcase competitions.

The Poultry Section

Industry Trends.—Commercial egg production had reached the record level of 62,000,000 dozen in 1960-61 but declined by about 8 per cent in 1961-62, largely because of lower returns to producers since October, 1961.

The trend to larger farms has continued as is shown in layer flock registration compiled by the N.S.W. Egg Marketing Board:—

Size of Flock	No. of Flocks		Total of Laying Stock	
	Nov., 1960	Nov., 1961	Nov., 1960	Nov., 1961
			Thousands	Thousands
75 — 500	6,604	5,659	809	766
501 — 1,000	870	861	646	644
1,001 — 2,000	912	867	1,345	1,282
2,001 — 5,000	901	917	2,758	2,843
5,001 — 10,000	181	182	1,182	1,209
Over 10,000	46	53	823	902

Flock numbers, which include pullets being reared for laying flock replacements, indicated that the rearing programmes are continuing to maintain flock strength at about the same level as in 1960-61.

There has been a significant improvement in the laying genotype of leading strains. Results of official tests and the general observations by field officers indicate that the average yield per layer has increased by 24 eggs per year over the last five years.

The broiler industry has further developed; through greater specialisation, and the breeding of improved meat strains for fast early growth and efficient food conversion. The larger breeders are producing broiler chickens from female lines of moderate egg producers and sire lines bred exclusively for meat quality.

The broiler industry has reached the stage of large poultry abattoirs. Full, regular supplies of well-presented birds are available for the retail trade. It has been estimated that 12,000,000 broilers were raised this year. The production will continue to increase.

Poultry Improvement Plan (Eggs).—This is still operating, but most of the co-operating breeders have complemented the breeding programmes far beyond the original requirements of the Plan. The Department can now concentrate on research, and testing the productive capacity of private breeders' strains.

Laying Tests.—The Random Sample Tests are the important means of evaluating the economic qualities of commercial-grade egg-strain chicks available to the producer. Data from these Tests are the only reliable guide to improvement of productive capacity. Their accuracy has been improved by larger, more fully replicated samples; each of 100 pullets, hen-housed at 17 weeks of age.

The original Egg Laying Competition which operated for 61 years is finishing off. It served its purpose and is now outmoded. To cater for small breeders of pure stock, there will be an egg-to-layer test; the eggs will be received, hatched and raised in an identical environment.

Broiler Testing.—Two buildings, each 96 ft. x 30 ft., have been erected at Hawkesbury Agricultural College to raise pullets prior to housing for egg production, and to conduct broiler tests on a larger scale.

A broiler test of 12 samples, each of 200 meat strain chickens, ended in March, 1962, after 11 weeks. Significant progress was apparent—an average weight of 3.25 lb., with food conversion rate of 2.74 lb. of feed per pound of chicken raised.

Another test is proceeding; to coincide with the XIIth World Poultry Science Congress, in Sydney, August, 1962. This test comprises 16 samples from prominent Australian breeders, from four States.

Turkey Raising Test.—The first Turkey Raising Test was conducted at Wagga Agricultural College with five samples of 40 poults from breeders. Weight averages of the birds at 28 weeks were:—males, 18.4 lb.; hens, 11 lb. The food consumed per pound of turkey, liveweight basis, was 4.0 lb.

Extension Services.—Poultry Notes was sustained as a monthly periodical, in addition to articles for poultry newspapers. *Poultry Notes* goes direct to poultry farmers, and its contents are widely used by the rural press.

Four livestock officers (poultry) were engaged in District extension work in the Cumberland, Gosford-Wyong, Tamworth and Wagga areas. The districts where these officers are permanently stationed represent more than 90 per cent of the State's egg and poultry meat production. A large part of their work is by personal contact but they also prepare

Motor-driven Rotary Plucker

In keeping with growth of broiler specialization this hot water bath, rotary plucker system on a near-Sydney farm can put out 600 birds in a day.

articles, give radio broadcasts and lectures and arrange field days. The following figures briefly relate to their field duties and other activities for the year:—

Visits to private farms	1,763
Field days	17
Poultry Schools	3
Visits to Government institutions	43
Broadcasts	58
Attendances at meetings	81
Lectures and symposia	18
Press statements	85
Articles for rural press; poultry journals	70
Judging at poultry shows	6
Market reports	36

A livestock officer (poultry) is about to be appointed to the Mid Coast and Hunter Agricultural Region. One has been appointed to the newly created position for poultry meat production, to specialise in extension advice on broiler growing and turkey and duck raising.

The 11th Turkey Raisers' School and Convention at Wagga Agricultural College was again well attended by 60 students and turkey raisers.

Exhibition for Poultry Science Congress.—To demonstrate aspects of Australian poultry industry production the Department is organising a National Exhibition to be staged in Sydney during the World XIIth Poultry Science Congress. The Commonwealth and other States, and many firms and organisations connected with the poultry industry are co-operating. The Congress and Exhibition occur in August, 1962.

The Apiculture Section

Industry Trends.—Honey production in most centres was average. Low prices for honey provided little incentive to migrate hives long distances. Efforts had to be made to minimise costs. Because the season's honey production was nearer to normal, particularly by comparison with the heavy 1959-60 crop, stocks have eased, but prices have not risen appreciably.

New South Wales is the main honey producer State, yielding 30 per cent to 50 per cent of Australia's production. Usually, near to 50 per cent of Australia's production is exported, with the United Kingdom and West Germany as main outlets.

The predominating unsatisfactory prices have led to a potential remedial programme. A Commonwealth-wide plan to collect funds equitably and use them for advertising and research has been further developed. This year the plan was adopted in principle by agreement between the State Agriculture Departments and various apiarist associations throughout the Commonwealth.

Extension Services.—The staff position remained unchanged—an establishment of five comprising the Principal livestock officer (apiculture) at head office, one livestock officer (apiculture) at Hawkesbury Agricultural College, and a District livestock officer (apiculture) respectively at Wagga, Tamworth and Orange.

Beekeeping is found throughout the eastern half of the State, with about 4,000 registered beekeepers, operating over a quarter-of-a-million hives. The Department works closely with the commercial and the household producers.

To restrict travelling, the section gave major attention to group extension methods, but the livestock officers (apiculture) also have regulatory work, arising from diseases notifiable under the Apiaries Act, 1916-44. In this respect, prompt visits and inspections were made by them. They in some cases covered three or four Agricultural Regions.

Successful Regional schools were conducted this year, besides the annual Beekeepers' School at Hawkesbury Agricultural College in the summer vacation.

District apiary officers addressed beekeepers at their meetings and attended Agricultural Bureau field days and Departmental field days. They also prepared material for radio, television and press releases.

Hundreds of valued photographs, black and white, and colour, were obtained to illustrate Departmental literature and to support talks at meetings. Apiary officers co-operated fully with other Government Departments and with commercial and amateur apiarists' associations.

Numerous householder enquiries were dealt with; many were for advice on removals of unwanted swarms, and of colonies in cavity walls, etc.

Apiary at Wagga Agricultural College.—New apiary buildings have been erected at Wagga Agricultural College. The extracting room, hot room, wax room, work room and office greatly improve the lecturing and demonstration facilities for the College students and Regional apicultural schools. Some research, especially the testing of new equipment and techniques, will also be possible.

Agricultural students at Wagga College attend lectures to acquaint them with the role of apiculture in the general economy, with emphasis on bees as pollinating agents, and the effect of agricultural practices and insecticides on beekeeping.

Regulatory (and allied) Services in Animal Industry

Disease Incidences and Actions

Anthrax

Twenty-six outbreaks occurred, all in the enzootic areas. All were brought under control by inoculation, and destruction of dead carcasses. The outbreaks involved 47,824 sheep (1,036 deaths), 816 cattle (49 deaths) and 888 pigs (16 deaths).

In the Bourke district three outbreaks involved travelling stock and imposition of quarantine on the stock routes over which the infected animals had passed during the period of the losses. The routes were arterial. Their closure to all stock except those vaccinated against anthrax was necessary. This considerably inconvenienced landholders in the area.

Pleuropneumonia contagiosa

No outbreak occurred. Testing of Queensland cattle prior to entry into the two N.S.W. protected areas for this disease continued, but no reactor was detected.

Brucellosis

Bovine Brucellosis.—Control of this is based on voluntary use of Strain 19. The vaccinations are done by practising veterinarians. Field officers investigated suspected clinical manifestations of the disease, and in many instances submitted representative serum samples from the herds involved, for diagnosis.

The Brucellosis-Free Herd Scheme was maintained, mostly used by owners who wished to sell certified stock. Policy has been to encourage owners to rely on Strain 19 vaccine and sanitation rather than the building up of still susceptible brucellosis-free herds.

In the Brucellosis-free Herd Scheme eleven herds (740 head) were tested, without finding a positive. In the course of miscellaneous diagnostic testing of serum samples submitted by Departmental officers, 695 positives were found in the 4,721 cattle concerned.

Ovine Brucellosis.—The highest incidence was in the Dorset Horn breed, lower incidence in other British breeds and Corriedales, and very low incidence in Merinos. Vaccination is permitted as a means to control the spread of infection, but official recommendations have aimed to eliminate infection by testing, culling and segregation.

Brucellosis (Porcine).—This is relatively rare in N.S.W. pigs, but a high incidence occurred in one piggery; of 94 breeding stock, 58 returned positive reactions and a further 20 were doubtful. Breeding history in this herd has been relatively good with only two sows aborting.

The disease is being controlled by the destruction of the positive reactors, and consignment of the negatively reacting breeding stock for slaughter; and establishment of a fresh breeding herd, from introduced stock and from pigs bred on the place but double tested before entry to the breeding herd.

External Parasites of Sheep

Lice and Ked.—Official control of sheep lice and ked was maintained. Infested properties were quarantined until all sheep had been satisfactorily treated. In all, 780 properties, involving 875,405 sheep were so treated because of lice, and 67 properties, involving 45,665 sheep, because of ked.

Internal Parasites of Sheep and Cattle

Fascioliasis.—Above average levels were recorded in enzootic areas. Chronic infestations affected both sheep and cattle. In the autumn and early winter a number of outbreaks of acute infestation occurred in sheep.

Helminthiasis.—It was one of the worst worm infestation years on record for both cattle and sheep. The latter fared particularly badly in tableland districts. Weaknesses in programmes were shown up on many properties, particularly where owners had in the past relied exclusively on therapeutic control without regard for sound husbandry practices. In areas where high and continuous rainfall was experienced, the need to drench sheep at a 3 to 4 weeks interval, together with rotational grazing, became apparent.

Thiabendazole became commercially available during the year and was widely used for sheep. It was highly efficient. For cattle, neguvon was the anthelmintic of choice. It was satisfactory.

Paramphistomisis.—Towards the end of the 12 months this caused considerable trouble in north coast cattle. There were heavy infestations with the larval forms of this parasite.

Sheep Footrot

Seasonal conditions led to high incidence.

Armidale Quarantine Area Project.—This was the second year since establishment of Armidale Pastures Protection District as a footrot quarantine area, to serve as a pilot eradication project. All stockowners are required to report the introduction of sheep and to notify suspected outbreaks. Staff for inspections and to demonstrate eradication techniques is provided, in addition to equipment, by the Pastures Protection Board.

Since the inception of the project there have been 50 infected properties, and nine of them are still infected.

Bovine Tuberculosis

Control continued along the lines of recent years:—

(*a*) Testing, under the Milk Act, cattle in the milk distributing districts established by the Milk Board, which supply raw milk for human consumption.

(*b*) Testing under the Tubercle-Free Herd Scheme.

(*c*) Testing of cattle supplying raw milk to rural urban areas, in Tuberculosis Protected Areas, Quarantine Areas (urban), or directly under the Local Government Scheme.

(*d*) Testing in Eradication Quarantine Areas.

(*e*) Miscellaneous testing—cattle for export, cattle in contact with known infected animals, cattle purchased for soldier settlers, and private voluntary testing.

Tuberculosis—Grand Totals of all Testing

Test	No. of Cattle Tested	No. of Reactors	Percentage of Reactors
Milk Board Scheme	10,507	6	0.06
Tubercle-Free Herd Scheme	10,235	3	0.03
Local Government Testing	10,049	19	0.19
Quarantine Area Eradication	204,702	1,198	0.59
Miscellaneous	86,221	2,225	2.58
Total	321,714	3,451	1.07

The figures shown are for selected groups of cattle and do not necessarily give a reliable indication of the incidence of tuberculosis in all parts of the State. However, there was a considerable increase in the amount of testing undertaken in eradication areas, and this has revealed a reduction in incidence in those areas over previous years.

Overall, the volume of testing considerably increased. This was notably so in north coast dairying areas, where eight further Eradication Quarantine Areas were notified.

The further eight Eradication Areas notified were Upper Richmond, Tyalgum, and North Tweed (all contiguously along the N.S.W.-Queensland Border); Caniaba and Coraki (which adjoin the East Casino and South Lismore Areas); Woodford Island (which adjoins the Southgate Area); Clybucca (which adjoins the East Kempsey Area); and the Manning Quarantine Area.

Present policy is to increase the number of Eradication Areas to the extent permitted by availability of veterinary personnel. Herds in each Area are tested twice, at annual intervals; and if at the end of the second series of tests the Area evidence of tuberculosis is sufficiently low, testing is then on a biennial basis.

First-round testing was completed this year in four Quarantine Areas, and in the Illawarra Area the second-round testing was completed. Testing in the latter area will now be every two years.

Testing of beef cattle, which hitherto have received little attention in respect of tuberculosis, significantly increased.

In two groups of beef cattle properties a high incidence of infection was revealed. Three properties were involved in the first group. Ten tests were undertaken during the year on 3,169 cattle, with the detection of 460 reactors.

The second group were owned by a large pastoral company with holdings in N.S.W. and Queensland. In six tests in southern N.S.W., 3,085 tested cattle revealed 110 reactors; 761 cattle tested on two holdings in northern N.S.W. revealed 70 reactors. The properties of this company received cattle from one source in Queensland where testing subsequently revealed a high level of infection.

Poultry Pullorum

Testing Breeding Flocks.—This was the second year of operation of Stock Diseases Act regulations requiring the testing of all breed flocks from which hatching eggs, or chickens under 21 days old, are sold. Testing is required annually, with a re-test within 35 days where two per cent or more positive reactors are detected.

There was a decrease of 22 per cent in the number of birds tested in the current year, due to the increasing tendency of owners to cull birds over 14 months old.

The incidence of reactions was 0.3 per cent of birds tested. This figure was significantly influenced by a breakdown in one flock where, at an annual test, 550 positive reactors were discovered. The cause of such rapid build-up of infection was not determined.

Under the compulsory testing system, 199 flocks were tested, involving 398,983 birds, and 1,349 reactors were found.

Accredited Flock Scheme.—In addition, a voluntary Accredited Flock Scheme was maintained, with three separate classifications. In this scheme, 94 flocks were tested, involving 209,015 birds, and 812 reactors were found.

Poultry Mycoplasmosis

New Regulations.—New regulations in respect of this disease were introduced under the Stock Diseases Act. It is widespread among the State's poultry flocks. The regulations provide that all diagnostic agents for this condition must be approved in the first instance, while testing of poultry for mycoplasmosis is restricted to veterinarians.

The Swine Fever Outbreaks

Spread of Disease.—At the close of 1960-61 the main centres of infection appeared to be the outer metropolitan areas of Sydney and Newcastle; 26 piggeries had been affected, of which only three were outside the Sydney-Newcastle Quarantine Area. In the succeeding 12 months, 99 properties were found infected, and 34 of them were outside the Sydney-Newcastle Quarantine Area.

Affected piggeries outside the Sydney-Newcastle Quarantine Area ranged from Inverell in the north almost to the Victorian border. At the same time, the north coast and far northern tablelands appeared to be free. Accordingly, a Protected Area was established to prevent introduction of the disease. This area embraces about one-third of the N.S.W. pig population.

Mortalities Light.—A feature of the properties found infected latterly is very light mortality and, in fact, the disease might have been overlooked in many cases but for the gel diffusion precipitin test. This test, a challenge with virulent virus, is the only available method of establishing whether swine fever is present.

New General Quarantine Area Declared.—As the number of infected properties situated outside the Sydney-Newcastle Quarantine Area increased, it was necessary to institute control measures by declaring a General Quarantine Area for all that part of N.S.W. outside the Sydney-Newcastle Quarantine Area and the North Coast Protected Area. Within this General Quarantine Area, sale of store pigs and exhibition of pigs were prohibited; and regulations were introduced requiring that all pigs sold at public sales be slaughtered within seven days of the sale.

The declaration of the General Quarantine Area also allowed stricter control of the boiling of food refuse prior to feeding to pigs, as was already required under the Stock Diseases Act.

Low Virulence Hampers Eradication.—The original studies showed that the virus was of low virulence. Recent experience has amply confirmed this. The eradication programme is proceeding satisfactorily, but it is difficult to foresee how the last infected piggery can be detected without the more widespread application of a laboratory test. Almost all the recent outbreaks have been detected only by the application of the gel diffusion precipitin test on suspected properties; properties suspected hardly at all from the point of view of mortality, but because of possible association with previously confirmed outbreaks.

Swine Salmonellosis

The Organisms Detected.—The more intensive inspections in piggeries due to the swine fever outbreaks uncovered a number of disease outbreaks caused by salmonellae. Ninety-five of those investigated were found to be caused by septicaemic salmonellae. Nearly all were due to *Salmonella choleræ suis*. *S. typhimurium* was the only other salmonella incriminated.

The mortalities generally occurred suddenly, quickly affected many of the pigs exposed, then subsided. Antibiotics in the feed or drinking water, or sulphadimidine injection, shortened the outbreak.

Quarantine Imposed.—Quarantine measures were imposed on affected properties. Routine specimens were submitted for elimination of swine fever, and where no suspicion arose from examination of the specimens, the properties were released.

Oedema Disease of Swine

Suggestive Evidence.—In most of the pig mortalities investigated, no particular pathogen was incriminated. Some were probably caused by oedema disease. In these there was a typical oedema history, and the post mortem signs and lesions were consistent with those reported from confirmed overseas outbreaks. By these measures it is thought that oedema disease might be one of the more important diseases of pigs in N.S.W.

Diagnostic Criteria Being Established.—Investigations are in progress, to fix criteria to establish a diagnosis of oedema disease.

Bovine Infertility—Beef and Dairy Cattle

Dairy Cattle Vibriosis.—Vibriosis continued to be incriminated as the major cause of dairy cattle infertility.

Three outbreaks of trichomoniasis were brought to light, all in dairy herds. There was one suspected incidence of virus infertility.

Survey of Beef Cattle Vibriosis Incidence.—For the first time vibriosis was diagnosed in beef cattle. Several beef herds, in various parts of the State, revealed it when low calving percentages were investigated.

To establish the extent of incidence in beef herds a survey was done. This was based on the agglutination test of mucus samples collected from beef cows at several abattoirs in various parts of the State.

From 709 samples tested, positive reactions were returned by 176 and doubtful reactions by 99. Thus, vibriosis would seem to be widespread among the State's beef heards.

Bee Diseases

American Foul Brood Incidence.—These were minor occurrences, except in one of the largest apiaries. In this case the owner did not detect it in the early stages and it became widespread in his establishment before control measures were enforced.

Nosema Disease and Sac Brood.—These were of minor importance.

Stock Foods and Medicines Act

Stock foods registered under the Act this year totalled 1,526, and 214 wholesale dealers were involved—an increase of 168 products and two firms by comparison with 1960-61.

The Stock Medicines Board granted registration to 1,782 preparations. Registration was refused in the case of 97 applications, due to excessive claims, inefficient formulation or possible toxicity. In addition, applicants withdrew 112 applications. A further 95 applications were deferred for later consideration.

Cattle Compensation Act

More Claims, Payments Less.—Some 6,748 claims were dealt with, involving 11,693 animals, with compensation payments amounting to £175,993 3s. 6d.

Compared with the previous year's figures, claims increased by 600 and animals by 453 whilst compensation payments were £14,804 less.

Diseases Concerned.—Diseases for which compensation was paid were as follow:—Tuberculosis, 5,755 cattle; cancer, 3,425; actinomycosis, 1,930; actinobacillosis, 566; Pleuropneumonia contagiosa, 4; trichomoniasis, 5; Johne's disease 8; total 11,693 cattle.

The Refused or Reduced Claims.—Payment was refused on grounds as follow:—Delayed notification of disease by owners, 122 claims; failure of owners to notify disease, 5; failure to pay compensation levy, 11; and delayed application for compensation, 2. Total 140 claims.

Payment was reduced in the case of 118 claims, where application for compensation was not made within 60 days of slaughter.

Continued Increase of Fund.—In each of the past four years the balance of the Cattle Compensation Fund has increased. The position was as follows:—

	£	s.	d.
Balance as at 30th June, 1959	109,599	0	10
Balance as at 30th June, 1960	237,873	2	8
Balance as at 30th June, 1961	376,209	9	8
Balance as at 30th June, 1962	599,767	12	7

The 1961-62 balance is the greatest since the Fund started.

Commonwealth Quarantine Act

More Port Inspectors.—Work associated with administration of the Commonwealth Quarantine Act, 1908-61, continued to increase. Increased air-transport has led to the need for Port inspectors full time at Kingsford-Smith Aerodrome, Mascot, and appointment of two more Port inspectors has been approved. Thus, a total of five will be attached to the Animal Quarantine Service, Sydney.

Liaison with Customs Officers.—Liaison and co-operation between the Animal Quarantine Service and the Department of Customs and Excise continued, to the advantage of each service. A senior officer of the Animal Quarantine Service addressed Customs Trainee Schools at intervals. The explained significance of the Animal Quarantine Service enhanced the co-operation.

Animal Imports.—The numbers of dogs imported from New Zealand and the United Kingdom and birds from New Zealand increased.

Fewer horses were imported. Because of the rapid spread of African Horse Sickness from central Africa through Middle East countries transport of horses from the United Kingdom through the Suez Canal was prohibited. The disease is spread by insects, and chances of horses being bitten whilst coming slowly through the Suez Canal constituted too great a risk.

Bird smuggling again received attention in co-operation with Customs officers. One blatant case was discovered. The offender was prosecuted by the Department of Customs.

Animal Products Imports.—Imported animal products took a lot of attention even though the volume of some items declined. There were less tinned meat and poultry, particularly from U.S.A. and Canada; less wool, from South Africa, India, Pakistan and New Zealand; and less frozen meat and meatmeal from New Zealand.

Main increases were fish meal, Peru having entered the field formerly held by South Africa, and feathers from Hong Kong. Cheese imports against increased.

Towards the end of the year the provisions of the Quarantine Act were amended to restrict the importation of cattle hides from certain "risk" countries.

Passengers' Luggage.—Animal Quarantine officers and Customs officers co-operated in inspections of passengers' baggage arriving by both sea and air. Normal quantities of illegal goods were seized, such as salami, other meat products, homemade cheese, and certain Eastern foods. The number of blatant attempts to introduce illegal goods increased, particularly by southern European migrants.

Parcel Post.—The volume of goods from overseas by parcels post, and subject to quarantine control, continued high. The main seizures were in parcels to private persons, including rural addresses. One parcel, from Hong Kong to an Asian student in Sydney, contained 10 tins of meat products, each tin labelled as fruit. This was an example of the attempts to introduce prohibited goods.

Ship's Pets.—Strict supervision over ship's pets on overseas vessels continued.

Ship's Garbage.—Disposal of this was subject of a Quarantine Services conference. The practicability of disposal by dumping it at sea was discussed, but the cost prohibits it. The present method of disposal has many disadvantages, causing anxiety to all who are associated with exclusion of exotic diseases.

Meat Inspection Services

Volume of Inspections at Time of Slaughter.—These were at the State Abattoir and at 27 other slaughtering establishments, throughout the State. The number of stock inspected and branded increased.

Bovine cattle increased by 185,085—45 per cent more than in 1960-61. Calves increased by 15,014, or 4 per cent. Pigs increased by 46,367; or 10 per cent. Sheep decreased by 228,000, or 3 per cent.

More Inspectors are now needed, because of increased stock killed and the faster killing in most abattoirs.

Ante-mortem Inspection of Stock.—All bovine cattle offered for sale at Flemington Saleyards and passing through the State Abattoir gates for slaughter were inspected on the hoof. Suspect cattle were marked, and recorded for special post-mortem attention.

All pigs admitted to the Homebush Bay pig market were inspected before sale, and tattoo branded for identification after slaughter. This, in case of disease, was to assist in the Swine Fever eradication programme. The tattoo brands also helped to police the provisions of the Swine Branding Act.

Homebush Bay Meat Market.—Inter-state meat was re-inspected and re-branded; the condition of all meat entering the market was checked, and the hygienic handling of the meat and cleanliness of vehicles and equipment was supervised. A high standard was maintained.

First offenders were warned and their names and addresses recorded. Three persons were prosecuted and convicted for smoking in the Meat Hall and one person was convicted for carrying meat in a dirty vehicle. Transport was closely supervised. Carriage of meat was permitted only in vehicles which conformed to the requirements of the Pure Food Act.

Lamb Branding, and Shop Inspection.—State meat inspectors did the selection of lambs at all works where the State service operates, other than the State Abattoir.

The Lamb Branding Act was policed in the Metropolitan Abattoir Area by visits to butchers' shops. At the same time the Meat Industry Act was policed, with respect to the inspection branding of all classes of meat for sale in the shops.

Re-Inspection of Meat Introduced into the Metropolitan Abattoir Area.—The introduction of meat into the County of Cumberland was supervised. From within New South Wales, only meat bearing the State meat inspection brand, or for export, was granted entry. From sources outside New South Wales, only meat from works of export standard was accepted. Such meat, except that required for export only, was re-inspected and re-branded with the New South Wales meat inspection brand.

From *within New South Wales*, meat came from abattoirs at Aberdeen, Bellingen, Blayney, Bourke, Byron Bay, Casino, Cootamundra, Daroobalgie, Dorrigo, Dubbo, Gosford, Goulburn, Grafton, Gunnedah, Inverell, Lismore, Macksville, Maitland, Merimbula, Newcastle, Orange, Riverstone, Tamworth, Tenterfield, Ulmarra, Wagga Wagga, Wallangarra, Wingham, Woy Woy, Woonona and Yanco.

From *outside New South Wales*, meat came from New Zealand, Queensland, Tasmania, Victoria, South Australia and Western Australia.

Meats Introduced into the Metropolitan Abattoir Area from All Sources

Class of Meat	Carcases	Piece Meats
		lb.
Beef	399,953	6,789,735
Veal	353,187	531,104
Pork	340,222	3,834,606
Mutton	2,054,315	7,368,266
Goat (from Daroobalgie)	8,995	....
Bacon	21,193 sides	1,302,346
Sundries	....	11,314,916

Government Contract Meat.—Meat for delivery under contract to Government institutions was inspected for conformity with contract specifications, and was appropriately branded for guidance of the institution.

Movement of Pig Meats.—Movement of all pig meats from within the Cumberland-Newcastle Swine Quarantine Area, to places outside it, was policed. Permits were issued where risk of taking infection beyond the Quarantine boundaries did not exist.

Knackery Inspections.—Part of the time of two meat inspectors was spent at two knackeries in the metropolitan area; 12,018 horses and seven cattle were slaughtered there.

Revenue.—The Meat Inspection Service is financed by fees provided for under the Meat Industry Act. The sources of revenue were as follow:—Meat inspected and branded by State meat inspectors at the time of slaughter; meat re-inspected and re-branded when introduced into the Metropolitan Abattoir Area from sources outside New South Wales; meat from Council owned Abattoirs, inspected and branded, with the State brand, by approved Council-employed meat inspectors and introduced into the Metropolitan Abattoir Area; and meat branded for export, transferred, and re-branded for local consumption in the Metropolitan Area.

Certain meat from private Abattoirs where fees are paid to the local Council, under the Cattle Slaughtering and Diseased Animals and Meat Act, was allowed into the Metropolitan Abattoir Area free of charge. Such meat was inspected at the time of slaughter by Council-employed meat inspectors, approved under Section 21A of the Meat Industry Act, and branded with the State inspection brand.

Condemnations of Meat.—All meat found on inspection to be unfit for human consumption was condemned and destroyed.

Meat Damaged by Flood.—Flooding of the Nepean River and tributaries in November, 1961, damaged 605 tons of meat at the Riverstone Meatworks. The meat was condemned unfit for human consumption.

T.B. Reactor Cattle Slaughtered and Inspected at the State Abattoir.—The total was 495. Of these, 39 (7 per cent) were total condemnations; six (1.2 per cent) were partial condemnations; and 69 (14 per cent) were cases of head only. The total passed was 376, including 120 (24.2 per cent) without visible lesions.

T.B. in Cattle (other than Reactors).—A survey covering 182,872 cattle slaughtered at the State Abattoir showed that 461 cattle (0.25 per cent) had one or more visible lesions of Tuberculosis.

Suspect Cattle Slaughtered and Inspected.—At the State Abattoir and Flemington Saleyards, 599 country suspects were slaughtered and inspected. They revealed the following—four cases of tuberculosis; 176 cases of actinomycosis; 121 cases of actinobacillosis; 205 cases of cancer; 23 cases of injury; three cases of N.V.L.; 40 abscess cases; and 27 others.

Of 681 cases suspected at Flemington and Homebush Bay, the results when the animals were inspected after slaughter were as follow: two cases of tuberculosis; 150 cases of actinomycosis; 273 cases of actinobacillosis; 108 cases of cancer; 37 cases of injury; seven cases of N.V.L.; 65 abscess cases; and 38 others.

Beef Liver Condemnations.—Reasons for condemnation of beef livers were surveyed. Of 24,000 livers examined, 6,204 were condemned. The conditions found were: fluke infestation (20 per cent); hydatids (1.7 per cent); telangiectosis (1.1 per cent); abscess (1.5 per cent); extensive adhesions (1.25 per cent); and others (0.2 per cent).

Sheep Liver Condemnations.—Causes of condemnation of sheeps' livers were surveyed; 4,000 livers per month were included in the survey. In the 48,000 livers inspected, the following conditions were recorded:—Fluke infestation (13.2 per cent); hydatids (6.1 per cent); *Cysticerous tenuicollis* (6.1 per cent); melanosis (3.2 per cent); other parasitic conditions (4.1 per cent); *Caseous lymphadenitis* (2 per cent); and chronic hepatitis (0.3 per cent).

"Knotty Gut" in Sheep Intestines.—Incidence of Oesophogostomiasis ("knotty gut") were surveyed. The survey covered 4,000 sets of sheeps' intestines per month. Of the 48,000 sheep 26 per cent were affected with the condition. The intestines in each case were unsuitable for manufacture of sausage casings.

Board of Tick Control

Eradication Results in Areas West of the Richmond Range.—Eradication continued in Rivertree Quarantine Area and northwest Rivertree was released from quarantine on 20th July, 1961.

Arrangements were made later to gazette the Currawinya Quarantine Line, in the southern part of Rivertree. This Line was established in October, 1961. Thus the south-western section of Rivertree, about 13,000 acres, was separated from the known infested portion; and 21-day inspections commenced in January, 1962, to determine its tick status.

In the second round of inspections in February, 1962, widespread infestations were found in it. So normal control measures were re-instituted. No immediate progress towards releasing this section from quarantine was possible.

Further tick infestations were found also in the portion of Rivertree east of the Currawinya Quarantine Line; in the area found infested in 1960-61.

Check on Eradication in Grafton Quarantine Area.—In a further check on the tick status of the Grafton Quarantine Area, 21-day examinations were recommended in October, 1961. These have continued to 30th June, 1962, and 854,541 head of stock have been examined. Also, all moving stock were examined and movement permits were issued.

All ticks collected in these examinations were submitted to Lismore for confirmation of identification. No evidence of cattle tick was detected.

Eradication in North-eastern Maclean Quarantine Area.—Checks done in March, 1961, had revealed tick infestations near Tabbimoble Creek and Mororo. Subsequent action was taken to separate the North-eastern Maclean Area from the remainder of the Grafton Area by the erection of a boundary fence, and gates across various roads.

An eradication policy was commenced in January, 1962, after all the unmusterable country had been leased and emptied of stock; 44,015 acres were leased. Only a relatively small portion of the area was adequately fenced and musterable.

The stock on the holdings involved have been treated at fortnightly intervals since 8th January, 1962, in Delnav. No evidence of cattle tick has been found during the eradication campaign. All unmusterable country has been regularly patrolled and no evidence of straying stock has been found.

Tick Fever; Satisfactory Year.—There was only one outbreak of tick fever. In Tweed Quarantine Area late in June, 1962, at Piggabeen, near the Queensland border, one animal died. The Veterinary Research Station, Glenfield, confirmed the presence of *B. argentina* in smears. The usual control measures were put into operation.

In addition, three other holdings are still in quarantine. Two of these are in Casino Area. One is due for release in August, 1962, and one in December, 1962. The third is in Tweed Area and due for release in February, 1963.

The complement fixation test for detection of infected animals is expected to be available in the coming year. Also, surveys using the thick blood film technique as developed by C.S.I.R.O. workers may be undertaken.

Control Policies.—Following release of the Report by the Committee of Enquiry appointed by the Commonwealth and New South Wales Governments, a general change in policy has been undertaken. The main features are—a strategic dipping campaign, whereby all stock are treated at 21-day intervals for a short period of the year, and fewer treatments of infested stock, at longer intervals. Necessary treatments of infested stock were at 21-day intervals, in lieu of 14-days as previously required.

Control Work East of the Richmond Range.—Within the Richmond, Tweed and Kyogle Quarantine Areas the strategic dipping campaign was from 1st October, 1961, to 15th January, 1962. Stock on every holding were given five treatments at 21-day intervals. Staff maintained the dips and supervised the treatments. When the dipping period was over, surplus staff were transferred west of the Richmond Range. Staff who remained made examinations on as many holdings as possible until the end of May, 1962, to determine the number and degree of infestations, following the new policy.

Over 95 per cent of stock were treated in the period of the new control policy, and the results are very promising. The season was very favourable for tick life, so the results, relatively, are probably even better than the figures indicate. The following table shows the position as it has been over the last three years:—

Area	Number of Infestations Detected		
	1959-60	1960-61	1961-62
Bangalow	78	30	14
Kyogle	19	11	3
Lismore	65	31	8
Nimbin	62	26	11
Tweed	69	28	4
Casino	111	33	20

The numbers of inspections made in Lismore, Nimbin, Bangalow, and Kyogle Areas in the latter part of the year, were comparable in 1960-61 and 1961-62; so the figures shown for these Areas are accepted as reliably indicating the infestations position.

Control Work West of the Richmond Range.—A policy of strategic dipping was undertaken in the Woodenbong, Tabulam, Bonalbo and Copmanhurst Areas in 1962. The programme was planned to comprise four treatments at 21-day intervals, as from 1st February, 1962, but the question of dip material arose, requiring a Government decision to change from hydrocarbons to organic phosphates. The dipping programme then started early in April, 1962, and the late start reduced the treatments to two. All treatments were done by 31st May, 1962.

The year favoured tick life but few infestations were found, as shown in the following table:—

Area	Number of Infestations Detected		
	1959–60	1960–61	1961–62
Bonalbo	5	1	..
Tabulam	9	1	..
Woodenbong	2	4	2
Rivertree	..	2	2
Copmanhurst	1	..	..

All moving stock were examined prior to movement in Woodenbong, Bonalbo, and Tabulam Areas, whilst in Copmanhurst the policy was that all stock receive one clean treatment prior to movement. In all Areas movement permits were required.

Examination of Stock at Abattoirs.—The policy of retaining an assistant at Macksville Abattoir and one at Tenterfield Abattoir to examine stock slaughtered was continued. At Tenterfield Abattoir the assistant also supervised the unloading of cattle moving from Wallangarra by train, and the dipping of all ex-Queensland calves prior to slaughter.

No tick specimen was detected at Tenterfield but many were collected at Macksville. All were check-identified as *Haemaphysalis* or *Ixodes* species. No evidence of cattle tick was found.

Claims for Compensation.—Compensation claims for loss of 90 head by death or injury were paid—£1,988 in all.

Fencing of Quarantine Boundaries.—The boundaries were maintained and improved by 20 miles of new fencing and 40 miles of extensive repair work.

Dip and Hut Construction.—The Dip Maintenance Gang (D.M.G.) constructed three new dips, one was in Lismore Area and two on the Cattle Tick Research Station, Wollongbar. A new bath was built for a dip at Bonalbo Area. The D.M.G. also did fencing, road-making, and yard construction at the Cattle Tick Research Station.

Field staff repaired 335 dips within the Tick Quarantine Areas, and gravelled 88 dip yards and started repairs to three dips in Kyogle Area.

More than 300 dips were emptied, cleaned out, and recharged with organic phosphates.

Five huts were transferred and re-erected on new sites; a new store was built at Lismore Tick Quarantine Office; a new double garage and storeroom were built at Mallanganee Tick Quarantine Office; and 11 huts and 31 tents were renovated.

Staff Numbers Constant.—The year commenced with 528 men. There were 14 less at the end of the year, only because some vacancies late in the year were not filled.

Transfers totalled 272, most of them because adoption of a strategic dipping policy required transfer of staff from west to east of the Richmond Range, then from east to west, and again from west to east.

Establishment of Cattle Tick Research Station.—Every effort was made to press on with establishment of the Cattle Tick Research Station, Wollongbar but the amount available was underexpended to the extent of £35,000.

The Director took up duty in October, 1961; a Senior Assistant Inspector of the Board of Tick Control was transferred to supervision of construction of farm buildings, roads, fencing and other improvements, and to receive the incoming scientific stores; and a junior farm-hand was appointed.

Double fencing of the boundary is nearly completed. Fifty chains of road are sealed. A permanent water supply is installed. Construction of dips and yards and garage-workshop have advanced. A residence, two store-rooms, tick-proof cattle stalls, and a small laboratory are complete.

Cattle, about 100, received from Wollongbar Agricultural Research Station and Grafton Experiment Farm, were later sold and replaced by young and less costly animals, more suitable for experimental work.

Experiments started in April, 1962, to determine the life of ticks in winter under local conditions.

Analyst's Section.—Work in the Laboratory of the Board of Tick Control, Lismore, has been, apart from routine analyses, largely on problems associated with the dip change from hydrocarbons to organic phosphates. Some of this investigational work by the Analyst is covered in the following paragraphs:—

Development of Methods for Analyses of Organic Phosphates: Analytical methods for analyses of organic phosphates in cattle-tick dips and in animal tissues, have had to be developed. Each organic phosphate has required a different method. Some of the methods have been developed almost entirely by the Laboratory. The organic phosphates being used within the Tick Quarantine Area are—Diazinon, Bayer 21/199, Delnav, and Trithion.

Gas Chromotography Method: Investigations have been undertaken concerning this method of organic phosphate analysis and the Laboratory staff are now constructing a gas chromotography unit because of its obvious value for further investigation of organic phosphates.

Spectroscopic Method: Spectroscopy is increasingly valuable in the laboratory. The ultra-violet spectrophotometers have been used extensively, and provisions are being made for an infra-red spectrophotometer.

Stirring and Settling Rate Tests in Organic Phosphate Dips: Because of the change from hydrocarbons to organic phosphates, early in the year four dips were charged, respectively with the four organic phosphates—Diazinon, Bayer 21/199, Delnav and Trithion. This was to provide a study of behaviour of these preparations in the dips, by means of "stirring" and "settling rate" tests.

Manual stirring followed by stirring with ten head of stock were sufficient to bring Bayer 21/199 and Diazinon, the two powder formulations, to a satisfactory dip strength. With Delnay and Trithion, the two emulsion formulations, manual stirring of two clean dips was enough to bring them to normal dipping strength.

"Settling rate" tests showed for Delnav and Trithion no significant fall in concentration within 80 minutes. For the two powder dips the fall was more rapid. The percentage of medicament present in the respective dip after 80 minutes of rest was as follows: Delnav, 94 per cent; Trithion, 93.7 per cent; Diazinon, 66 per cent; Bayer 21/199, 60 per cent. This work will be repeated before definite recommendations are made on stirring procedure for each medicament.

Micro Determination of Hydrocarbons in Animal Fats: Further analyses of fat specimens of cattle killed at abattoirs within and outside the Tick Quarantine Areas were done as requested by Department of Primary Industries because of the trade problem associated with residues in meat. Specimens were analysed for DDT and BHC. Samples from within the Tick Quarantine Areas showed the two materials. The amounts ranged from nil to 144 mg./kg. in the case of DDT, and from nil to 6.7 mg./kg. in the case of BHC.

Similar work with butter samples, in respect of DDT, revealed amounts ranging from nil to 11.7 mg./kg.

The Lismore laboratory analysed also for D.D.T. and BHC many specimens from trials being done by Glenfield Veterinary Research Station, following use of DDT and BHC on pastures.

Organic Phosphate Residues: Some analyses were done after use of Diazinon as a dip and as a spray treatment, but no evidence of Diazinon residues was detected.

Calf Dipping Trials with Organic Phosphates: Work in association with Glenfield Veterinary Research Station tested the possible toxicity of organic phosphate dips for calves. At Glenfield the four preparations (Bayer 21/199, Delnav, Diazinon and Trithion) were each used at double the strength normally used in the dip; and calves aged about 3 months were dipped without ill affects. The analyses of dip samples were done at Lismore laboratory.

Head Spraying of Cattle. Preliminary trials of a Modification of the "Nuttal Sprayway" Cattle Race for head-wetting of stock were attempted, but complications occurred with the pump. No finality was reached. The further work will be done at the Cattle Tick Research Station, Wollongbar, in due course.

Queensland Border Control

Stanthorpe Section

Stock Movements.—Stock movements within the Section were again light. From Queensland to N.S.W. the movements were: 111,778 cattle, 17,863 sheep, 27,552 swine and 2,561 horses. From N.S.W. to Queensland they were: 4,600 cattle, 209,545 sheep and 608 horses. Total revenue from dipping fees was £3,935; of the cattle moving to N.S.W., many moved to the two abattoirs—without treatment.

Fencing.—Another four miles of fencing was erected, by contract, on the Donnybrook-Limestone section, west of Wallangarra at £975 per mile. The inaccessable country meant construction of 11 miles of road to enable machinery and wire to be taken in.

Some 63 chains of border fencing around Wallangarra Railway yards was renewed by contract, at £525 per mile.

About 30 chains of new fencing was erected by staff, on the road frontage of the Departmental Quarantine Reserve at Stanthorpe Crossing Place. Similarly, seven and a half chains was erected by staff on the western boundary of the Departmental Quarantine Reserve at Killarney Crossing Place. The staff also renovated sections in the Acacia Plateau-Killarney and the Lower Acacia-Barlows Gate sections.

Dips.—The dips are, in general, in good condition. Some minor timber replacement is needed at Wallangarra dip. Gravelling has been arranged for both Wallangarra and Stanthorpe dips. Both Wallangarra and Stanthorpe dips were emptied, cleaned and re-charged with organic phosphate.

Wallangarra Main Gate and Office.—On request, Department of Main Roads has surveyed for provision of divided lanes at the Gates. To extend these into Queensland would be difficult, because of a highway bend on the Queensland side and the junction of other roads. The decision is to position the lanes in N.S.W. about 100 yards south of the existing Gates. It will require re-establishment of the Gates and office buildings.

Goondiwindi Section

Stock Movements.—Stock from Queensland to N.S.W. were much less than in 1960-61. The difference between the two years was not so marked for stock from N.S.W. to Queensland.

From Queensland to N.S.W. the stock movements comprised: 9,450 fat and 74,743 store cattle, 19,381 fat and 157,242 store sheep, 30 swine, and 4,336 horses. From N.S.W. to Queensland the movements comprised: 11,060 fat and 20,214 store cattle, 95,112 fat and 211,458 store sheep, 12 swine and 147 horses.

In 1960-61 the total revenue in dipping fees was £1,596 for 29,215 cattle, 1,481 calves, 1,807 horses and 18 sheep. The 1961-62 figures reveal sharp decline in numbers dipped: £679 from dipping fees, for 11,224 cattle, 1,681 calves, 1,315 horses, and one sheep.

Each year sees increased numbers moved by motor transport and for longer distances.

No P.P.C. was detected in cattle from Queensland this year. A few from areas in Queensland's Schedule "W" were infested with Kangaroo tick. This was in December, 1961. No later infestation was found.

Dips.—Only minor repairs were necessary. Goondiwindi, Keetah and Texas Dips were changed over from DDT to Delnav in mid-June, 1962.

Fences.—Landholders have done a lot of fence repair and renewal along this border section in recent years. Despite this, repairs and renewals remain a continual problem, particularly after river floodings. However, because the land on either side of the river in the eastern half of the section is mainly used for growing crops fence repairs are promptly done.

West of Mungindi Section

Stock Movements.—Dry weather in the spring and early summer was followed by heavy late summer rains. There were local floodings. Travel on most roads was restricted. The trend towards motor transport for stock movement continued.

From Queensland to New South Wales the stock movements comprised: 28,906 cattle and 239,740 other stock. From New South Wales to Queensland the movements comprised 558 cattle and 16,670 other stock.

Lice-infested Sheep a Problem.—Lice infested sheep from Queensland caused concern. Large mobs were held up at the border from time to time. As many as 20,000 were held up at one crossing in three weeks. Queensland does not appear to be very conscious of this infestation.

Land owners on the border have become very concerned about sheep being held up; dips are a long way apart, and some owners of dips are reluctant to allow infested sheep to use their yards.

Issue of Permits 181 is still a problem in most areas. Long travel distances often have to be made to inspect small lots of sheep.

New Crossing Places.—One new Crossing Place (Jobs Gate) has been gazetted, and one at Habnary Station, and other road projects, are under consideration. If any of the projected roads cross the border requests for further crossing places are certain.

The State's Sheep and Cattle Numbers

Sheep Numbers.—At the end of March, 1962, sheep in New South Wales numbered 69,498,000, an increase of 1,411,000 over the total at March, 1961, but still 1,502,000 below the record of 71,000,000 in March, 1960.

Cattle Numbers.—Cattle in New South Wales at the end of March, 1962, reached a record total of 4,399,000, an increase of 157,000 over the previous record of 4,242,000 in March, 1961. The increase was due to the further expansion in beef cattle numbers. These reached a record 3,127,000 total.

Meat Production.—Production of beef and veal in 1961-62 was about 228,300 tons. This, although about 31 per cent above the low output in 1960-61 was only slightly above the 1959-60 production.

Mutton and lamb production was about 197,800 tons, one per cent above the 1960-61 output.

Pigmeat production was about 31,800 tons, 10 per cent above the 1960-61 output.

DIVISION OF DAIRYING

Activities of the Division comprised the administration of Acts (mainly the Dairy Industry Act) and Regulations, herd production improvement activities, extension and research affecting the efficiency of the dairying industry, and maintenance of the standard of dairy products.

Production figures, for 1961-62 for the principal dairy products, compared with those for 1960-61, are as follows:—

	1960-61	1961-62
	gal.	gal.
Milk	327,140,000	342,826,000
	lb.	lb.
Butter	76,153,293	87,346,358
Cheese	11,862,788	13,335,558

Legislation Amendment

Dairy Industry Act—Margarine.—Action taken to police the quota restriction on manufacture of table margarine indicated need for an amendment of the Dairy Industry Act, and Cabinet has approved of the preparation of amending legislation. Action is now being taken by the Parliamentary Draftsman.

Regulatory Services

DAIRY INDUSTRY ACT, 1915-60

Advisory Committee.—The Dairy Produce Factory Advisory Committee approved three applications for registration of premises as dairy produce factories and one application for registration of a dairy produce store.

Appeal Board.—The Appeal Board, constituted under Section 2 to deal with appeals against decisions of Inspectors under the Act, did not have occasion to meet.

Factory Condition.—All factories maintained their plant and equipment satisfactorily. Generally, the factory position in the industry is satisfactory.

Factory Developments.—The Central Dairy Society factory at Raleigh has commenced structural alterations. When these are completed, transfer thereto of the Bellinger Butter Factory will take place. The Gloucester Dairy Factory's new building is nearing completion.

Certificates of Competency for Dairy Factory Operatives.—Six Dairy Science Schools were held, for tuition and examination of 85 candidates for qualifications under the Act. Also, many factories were visited by examining officers to conduct examinations not covered by the schools:—

Examination	Certificates Issued
Cheese Making	14
Butter Making	11
Milk Grading	57
Milk Testing	46
Cream Testing	43
Cream Grading	27

The number of applicants for examinations indicated that interest in qualifying for the various certificates has been maintained in the industry. Where special classes were held by dairy officers the results were satisfactory.

Butter Manufacture and Grading.—The butter grading staff regularly examined butter and cheese manufactured by N.S.W. factories and received at Sydney, Newcastle, Wollongong and Canberra for distribution and storage prior to sale on the local market. Samples from Wollongong and Canberra were sent to Sydney for grading. Butter manufactured at Casino Co-op. Dairy Society was also examined at that centre prior to cold storage.

Resultant information was furnished to factory managers and District dairy officers. This was to help overcome quality faults or other manufacturing defects noted at time of grading.

Considerable quantities of butter were imported into N.S.W. from other States during late autumn, winter and early spring to supplement local production. At the request of the selling agents the quality was checked by Departmental graders prior to distribution.

Quantity of Butter Examined and Graded.—The number of boxes of butter from interstate and intra-state sources examined by State graders was 1,505,417 compared with 1,298,976 in 1960-61 and 5,086 grade notes were issued.

Services through Shows and Competitions.—The services of grading officers were availed of as judges and stewards in the Dairy Produce Section of the R.A.S. Show, the Newcastle A. & H. Society, the North Coast A. & H. Society, Lismore, the Coff's Harbour A. & H. Society, and in the Competitions held in conjunction with the New South Wales division of the Australian Institute of Dairy Factory Managers and Secretaries.

Moisture and Salt Analyses Service.—Moisture and salt content of butter manufactured at N.S.W. factories were analysed, and the results forwarded to District dairy officers.

Biological and Chemical Examinations.—Samples were regularly taken and forwarded to Division of Science Services for biological examination. The results were forwarded to factory managers and District dairy officers.

A number of special investigations for butter quality defects were conducted at various factories. The Biology and Chemistry Branches, Division of Science Services, co-operated in many cases.

Factory Supervision by District Officers.—In addition to the foregoing services conducted by specialist officers in Sydney and at country centres, District dairy officers supervised the quality of milk and cream at site of manufacture into the various products. Thus, close supervision of quality control and close liaison between the farmer and the factory and between factory and distributor were maintained. This is reflected in the "Order of Merit" Scheme conducted by the Department to stimulate interest in quality uplift.

Milk and Cream Quality.—Statistics of Factory and Farm Visits.—Officers spent 6,493 hours in Dairy Produce Factories, check grading milk and cream and the manufacture of other dairy products. Three hundred and eight visits were made in connection with check grading milk and 612 for cream.

As a result of these checks, 3,963 farms were visited to advise farmers on how to overcome the defects.

Two hundred and three special investigations were made on farms for milk and cream defects, and 238 special investigations were made in Dairy Produce Factories.

"Order of Merit" Butter Certificate Scheme.—To be eligible for consideration for an Order of Merit (Butter) Certificate of the N.S.W. Department of Agriculture, a factory must submit for grading during a season the undermentioned percentages of its butter manufacture that has been branded as "choicest" quality:—

	Per cent
March-April	25
October-December	45
January-February	65
Seven months period (overall) covering those specified above	65

The specified seven months, of the twelve from 1st March of one year to 28th February of the next, are regarded as comprising a season.

To qualify for an Order of Merit Certificate a factory must also market, true to "choicest" brand, at least 92 per cent of its "choicest"-branded butter examined by butter graders of this Department and the Commonwealth Department of Primary Industry.

Percentage of Butter Marketed as Choicest.—This was 91.7 per cent, compared to 89.0 per cent in 1960-61, and fourteen factories were awarded Merit Certificates.

The comparative figures for five years past are:—

1957-58—86.8 per cent .... 4 certificates issued
1958-59—87.1 per cent .... 9 certificates issued
1959-60—90.8 per cent .... 11 certificates issued
1960-61—89.0 per cent .... 12 certificates issued
1961-62—91.7 per cent .... 14 certificates issued

Pasteurisation of Milk for Cheese.—Action was taken by the Department under the Dairy Industry Act, requiring all milk used for cheese manufacture to be pasteurised. This action was fully implemented and now all cheese milk throughout the State is pasteurised. Thus, cheese quality has been greatly improved and a health hazard which had caused the industry and health authorities concern has been eliminated.

Factories and Shops Act

As Departmental officers are authorised as inspectors under this Act to supervise safety measures within the dairy industry, all necessary steps were taken during the year to ensure conformity with these regulations. This work is done in conjunction with normal duties and does not necessitate special visits.

Dairy Industry Research

Funds and Organisation.—The research is in part financed from Departmental funds, and in part financed by funds from the Australian Dairy Produce Board. Expansion of work occurred in each of these fields.

As regards the work on Departmental funds, the Special Dairy Research Officer who has been on three years' study leave in U.S.A., resumed duty in August, 1961, at Hawkesbury Agricultural College. His main work now is on oxidisation of milk, but he is also working on bitterness in cheese. A Dairy Chemist of the Chemistry Branch, Division of Science Services, is also now at the College, to evaluate salt types and their use in butter manufacture. Also, a Biometrician seconded to Division of Dairying in April, 1960, is specialising in the genetical aspects of herd recording and dairy cattle breeding for production. His permanent appointment to the Division has been recommended.

As regards the work financed by Australian Dairy Produce Board funds, research continued into Blue Veined Cheese problems. A start has also been made to ascertain rapid methods to determine the composition of milk. A dairy officer has been appointed as full-time assistant to the Special Dairy Research Officer on this work and a bacteriologist from the Biology Branch of Division of Science Services is contributing part time research.

Milking Machine Efficiency Research.—A second research officer has been appointed to replace the specialist on this work who will be transferred from Hawkesbury Agricultural College to Head Office of the Division. The new appointee will devote his time fully to research. The specialist will direct this work and that of the Milking Machine Survey officers, and also develop extension aspects of the Milking Machine Efficiency project.

Milking Machine Efficiency Survey.—Apart from conducting surveys and research, the Dairy Research Officer on this work collaborated with the Milking Machines Standards Committee set up to check design and efficiency of certain parts of milking machines.

The five survey officers operating throughout the State are making farm visits at a rate exceeding 1,000 per year. The Survey is thus exercising a strong influence for the good of the industry.

The results collated last year from the 1957 to 1960 figures are being disseminated through all appropriate extension channels.

Testing Air-Flow Meters.—The Testing Station continued to function. It is testing and surveying an increasing number of air-flow meters from this and other States. This work is helping to standardize the air-flow meters in use to check milking machine efficiency.

Solids-not-Fat Recording:—A Research and Extension Project was commenced in 1960-61. It covers the testing for solids-not-fat of five Departmental herds and two units in the Herd Production Improvement Scheme. The solids-not-fat figures will be available shortly for publication.

These figures should give a previously unavailable indication of the solids-not-fat position covering various breeds and districts in N.S.W.

Bulk Milk Collection.—As a result of trials in 1960-61 of a number of bulk milk farm tanks, one dairy factory has established and is working under commercial conditions two bulk milk collection units in its area.

Herd Production Improvement Scheme

Herd Recording Expanded.—The herd recording work aims to give members reliable basic information for a programme of herd improvement to increase production efficiency. During the year, the number of herds and cows under Official Herd Recording have increased respectively from 220 to 230 and 8,700 to 10,000, and under the Group Herd Recording have increased from 1,333 herds to 1,335 and from 60,785 cows to 61,000.

Since 1959-60, the recording units have increased from 60 to 81, and there are two other units connected with solids-not-fat investigations (costs borne by the Commonwealth Dairy Industry Extension Services Grant).

Herd Recorder staff now totals 91, including eight herd organisers, 76 herd recorders and seven relief herd recorders.

Calf Marking Scheme.—This year 8,706 heifer calves were marked under this scheme. The total of calves now marked is 87,244. Of the total calves marked, 965 were bred by artificial insemination and seven were merit calves.

Certified Bull Scheme.—This year 416 certified-bull certificates were issued.

Sire Survey.—This year, officers of the Division of Dairying have brought forward a method to assess a bull by means of the production record of his daughters. The method is a modification of that used by the Milk Marketing Board of Great Britain, and has been adopted in this State for future Sire Survey work.

Co-operation with Artificial Breeding Centres, etc.—Departmental studs have provided two Guernsey and two Friesian bulls for use in the artificial breeding centres, and have a further two Friesians and one Jersey under offer to these centres.

Special matings to provide a continuance of the artificial breeding centres' breeding policy have been undertaken by artificial insemination of high production cows in the Department's Ayrshire, Friesian and Jersey cows. The bulls of these matings will be loaned by the artificial breeding centres to follow up their sire's work.

Government Dairy Herds

Production of the five dairy studs was maintained at a high level. Teams were exhibited competitively at the Sydney Royal Show, also at Yanco, Bathurst, Wagga and Hawkesbury Shows, with many successes.

At Sydney Royal Show, Hawkesbury Agricultural College gained the award for the most successful exhibitor in the Friesian section and the Yanco Guernsey team again won the William Newcombe Cup for the six highest producing Guernseys in the State.

Extension Services

School for Dairy Officers.—A Refresher Course for dairy officers was conducted at Hawkesbury Agricultural College School of Dairy Technology, in modern techniques of manufacture. Lectures were given by Departmental officers and personnel from private industry on topical matters. Sixteen officers attended.

Dairy Science Schools.—Six Dairy Science Schools were conducted for the tuition and examination of factory operatives, for certificates of competency in milk and cream testing and cream grading. Eighty-five operatives attended the Schools.

School for Factory Apprentices.—A School for factory apprentices was conducted at Newcastle by officers of this Division as arranged by the Department of Technical Education. Subjects included the theory and practice of milk and cream testing and milk and cream grading.

Butter Makers' and Testers' Refresher Courses.—Courses for dairy produce factory operatives were held in butter making and milk and cream testing at Hawkesbury Agricultural College. These were the first courses of their kind. They were attended by 32 butter makers and 25 milk and cream testers.

Addresses by Dairy Officers.—Addresses were given by dairy officers at Refresher Courses, short schools for farmers, field days, film evenings, Agricultural Bureau meetings, Junior Farmer Club meetings and other rural gatherings.

General Extension Service, Statistics of Farm Visits.—Almost 4,000 farms were visited by dairy officers for general extension work. Also, 112 visits were made in connection with Dairy Industry Grant demonstrations, and 1,157 for herd improvement instruction.

Dairy officers travelled by car 163,476 miles in the course of the year's work.

General Extension Service, Statistics of Group Activities.—Dairy officers attended for extension purposes 95 field days, 63 film evenings, 86 meetings of Agricultural Bureau branches and 40 Agricultural Shows. Approximately 160 radio talks were given.

Commonwealth Dairy Industry Extension Grant.—The 1961-62 allocation to N.S.W. under this grant was £64,880 for promotion of improved practices in the dairying industry. It was expended in the main on Grade Herd Recording, Sire Survey, farm demonstrations of a dairying technical nature, Milking Machine Efficiency Survey, and Testing Station (Air-Flow Meters).

Assistance under Colombo Plan.—Mr. D. I. Gillies, District dairy officer, spent eight months in the Philippines providing assistance under the Colombo Plan in the establishment of milk treatment plants. He previously had spent some months in Saigon, helping the establishment of a processing plant for the Vietnamese under the same Plan.

"Country Life" Newspaper's Dairy Farm Improvement Competition.—The 1961 competition attracted 82 entries. This competition, unlike most, encourages entries from dairymen on under-developed or newly established farms and it brings the extension service of the Department to them as an aid in raising production. In this manner, extension officers visit each farm at least twice to judge, and to give advice. Field days are held, one on the winning farm in each of the dairying districts.

DIVISION OF SCIENCE SERVICES

Biology Branch

Third Australian Plant Diseases Conference.—This was held in Adelaide in October, 1961. Three members of the Biology Branch attended. Several overseas scientists attended by invitation, and others who were visiting Australian institutions attended. They added greatly to the value of its proceedings. Two overseas scientists subsequently visited New South Wales.

Visits by Overseas Pathologists.—Dr. A. F. Posnette, of the East Malling Research Station, an international authority on virus diseases, especially of deciduous fruit, made a survey of orchards in the major fruit growing districts in company with plant pathologists and fruit officers. Plant pathologists gained a lot from his knowledge of the various manifestations of virus diseases and the chance to discuss local problems. His visit has given impetus to the work of the Deciduous Fruit Tree Improvement Committee.

Dr. K. F. Baker, University of California, a world authority on diseases of ornamentals, spent his tenure of a Fulbright Scholarship at the Waite Institute, South Australia, perfecting a method to pasteurise soil at a temperature of 140 degrees F. It removes soil pathogens while leaving some beneficial soil organisms unharmed. The method has been adopted by a number of N.S.W. nurseries, and the equipment has been installed at the Division of Science Services, Rydalmere. Dr. Baker spent some days inspecting local installations and advising on improvements. He also visited rose nurseries to study rose wilt virus. This is not present in California.

Dr. L. G. Weathers, citrus virologist of Riverside, California, spent his tenure of a Guggenheim Fellowship at Rydalmere. He visited citrus districts and studied the diseases of this crop in all parts of N.S.W. His knowledge of the virus disease position in California has been of great value to Australian pathologists.

Mr. L. L. Stubbs, virologist of the Victorian Department of Agriculture, spent a week in the Murrumbidgee Irrigation Areas. He inspected citrus disease problems and experiments with N.S.W. pathologists and fruit officers. Useful exchange of ideas on some obscure virus troubles took place. Mr. Stubbs identified on prickly lettuce and milk thistles in the area his recently described lettuce necrotic yellows virus.

Papers to Conferences.—Mr. C. D. Blake, plant pathologist, who has been working at Rothamsted during the period of his tenure of a Ben Fuller Scholarship, attended an International Conference of Nematology at Ghent (Belgium) in July, 1961, and presented a paper.

A representative of the Biology Branch attended the Clean Air Conference held in Sydney in February, 1962, and presented a paper.

Plant Pathology Section

New Plant Disease Records

Sixty-five new plant diseases were recorded in N.S.W.

Blind seed disease of rye grass (*Gloeotinia temulenta* (Prill and Delacr.) Wilson, Noble and Gray) was recorded on seed of perennial rye grass harvested at Goulburn. Apothecia of the fungus were developed in the laboratory from this seed.

Two bacterial diseases of cereals were recorded—leaf spot of pearl millet and leaf streak of grain sorghum. The causal bacteria were tentatively identified by the Commonwealth Mycological Institute as *Pseudomonas syringae* van Hall and *Xanthomonas holcicola* (Elliott) Starr and Burkholder respectively.

In the fruit industry, a trunk canker, crown rot and fruit rot of apples caused by *Phytophthora cactorum* (Lebert and Cohn) Schroet caused severe damage, especially to the variety Gravenstein in the Camden-Picton district.

Symptoms like rugose mosaic were seen to be widespread in cherry trees by Dr. A. Posnette of the East Malling Research Station during his visit in November, 1961.

Other records of interest included a *Fusarium* root and crown rot of asparagus which caused severe damage to some crops at Gundagai; black rot of carrot roots from the M.I.A. caused by a species of *Alternaria* similar to *A. radicina* Meier, Drechsler and Eddy; and a barn rot of tobacco caused by *Rhizophus oryzae* Went and Prinsee Geerling.

Powdery mildews (*Oidium* spp.) again damaged seedlings of native trees, especially *Eucalyptus* spp. in nurseries. A frond disease of bracken fern caused by an unidenified Dothideaceous fungus was common in central coastal districts.

Interesting identifications.—Amongst the many enquiries received, more than thirty were concerned with the edibility of various mushrooms and toadstools. Some of the fungi submitted were suspected of having caused gastric illness. In most of these cases a species of *Agaricus* in the *xanthoderma* group appeared to be the main culprit.

Another interesting identification was the fungus *Pithomyces chartarum* (Berk. & Curt.) M. B. Ellis, the species associated with facial eczema of sheep in New Zealand. The fungus was found on a rotting grape berry at Pokolbin in the Hunter Valley, and on a turf sample from Barham in the Riverina. It is probably quite widespread in N.S.W.

The Biology Branch Herbarium

The Biology Branch Herbarium was registered with the International Association for Plant Taxonomy at Utrecht in the Netherlands. It will be listed in the next issue of the Index Herbariorum with the standard abbreviation DAR.

Amongst the specimens received were two thousand fungi exsiccati, mainly of plant parasites. These were kindly donated by the United States Department of Agriculture.

Cereal Diseases

Wheat Diseases.—Wheat acreage has been steadily rising since 1956 and this season was no exception. Yields were good. Generally, diseases did not cause major loss.

Take-all was more severe than usual. In the Inverell and Griffith districts losses ranged between 5 and 10 per cent in some crops. At Inverell the disease was serious on heavy black soils. At Griffith it was most noticeable on irrigated crops on land previously under pasture for years.

Foot-rot caused by the pathogenic fungus *Fusarium graminearum* was again common in the north-west. In some crops it had spread from the roots up the stem above the second and third nodes. Plants infected in this manner lodged.

Stem rust developments were again interesting. New strains were isolated by the University of Sydney, and the position now is that all wheat varieties currently grown in N.S.W. are susceptible to one or more races.

Even the highly resistant varieties, Spica, Glenwari, Gala, Hopps and Mengavi are now susceptible to stem rust. The future of these varieties depends on just how quickly these new rust races build up.

Barley yellow dwarf virus was not recorded this year but undoubtedly it did occur. Some pathologists now suggest that this disease may be responsible for the appearance in crops of unthrifty plants from which only unimportant secondary parasites have previously been isolated.

The Australian Wheat Board listed twelve growers as having delivered bunt infected grain. Probably the disease occurred in quite a few other crops but the grain was not delivered to the silo.

Frost damage was less than usual, occurring only in isolated patches.

Hail damage was estimated at 2.75 per cent of a total crop of 75,000,000 bushels.

Oat Diseases.—Oat diseases were not particularly serious, even though the acreage increased. Barley yellow dwarf virus was recorded in some crops.

Maize Diseases.—The wet summer was conducive to maize diseases.

Leaf blight caused by *Helminthosporium turcicum* was especially severe. Losses were substantial. An unusual feature was destructive occurrence at both Glen Innes and Bathurst, two areas that usually do not favour it.

The stem and cob-rotting organisms were very active. Losses from cob rot in some crops in the north may reach the high level of 25 per cent, and a few as high as 40 per cent loss. Work continued on isolation and identification of the stem rotting organisms, and an artificial method of inoculating maize with the *Gibberella* stalk rot organisms has so far been successful.

When seed of varieties showing different degrees of susceptibility to the *Gibberella* organisms is collected, more conclusive information should be obtained as to the suitability of the artificial inoculation method. If this method is successful, it should be of value in the breeding programme.

In March and April, 1962, the boil smut quarantine areas in the Bathurst district and the maize and sweet corn crops in the area were surveyed. Boil smut, caused by *Ustilago maydis* has been recorded in Australia only in the Bathurst district of N.S.W. It appeared there in 1911 on an isolated portion of Bathurst Experiment Farm known as the River Farm, apparently introduced on seed from overseas. The crop was destroyed and maize was not planted in the area again until 1919 when the disease reappeared. Following this outbreak, no maize was grown on the farms until 1929.

Between 1929 and 1934 small areas of maize were grown each season on some portion of the infected area but no smut was observed. In 1935, however, the disease reappeared. The crop was burnt and the soil drenched with formalin.

Although surveys were done, the disease was not seen again until 1938. Then it was seen on a private farm near Bathurst. The crop was destroyed and the grower undertook to refrain from further plantings of maize. The following year the disease appeared on other properties and extended further in 1940. All twelve properties where the disease had occurred were quarantined.

Surveys have been carried out at regular intervals since 1940 and the disease has not been recorded now for twenty-two years. How long the fungus can survive in soil is not known. Therefore it will be difficult to decide when to lift the quarantine restrictions.

Several sweet corn quarantine areas were also inspected during the year but no diseases new to N.S.W. were detected. A conspicuous condition was a yellow striping and scorching of leaves. This was also common in the hybrid Iochief and is thought to be a genetical peculiarity.

Further testing for resistance to head smut (*Sphacelotheca reiliana*) was done. The properties where field testing was done in former years were no longer available, and all work in the past season was in the glasshouse. A technique previously found suitable in pilot trials was used. Results obtained for 157 inbreds and hybrids showed a wide range of susceptibility. Results obtained in the field were confirmed but, because of the much smaller number of plants used, the trials will be repeated in the coming season.

Sorghum Diseases.—Further large quarantine areas on the northern tablelands and slopes were inspected. Incidence of diseases was again very low. A virus disease thought to be caused by a strain of sugar cane mosaic virus, and present in similar crops last year, occurred again.

Sorghum plants were examined from many areas, and the most common disease was a severe zonate leaf spot. This has been recorded for a number of years but seemed unusually severe this year. The cause has not yet been determined.

Incidence of bacterial leaf streak seemed higher. More than the usual number of infected specimens were received. Although the disease has been recorded before, this is the first time the causal bacterium *Xanthomonas holcicola*, has been positively identified.

Weak neck, a physiological disorder, was seen in several crops. Losses in some were expected to be high. In one crop 20 per cent of the plants were affected. This high incidence could have been due to the weather conditions in the growing season.

Top rot caused by a *Fusarium* species was reported causing damage to 30 per cent of a Tumut crop of broom millet.

Millet Diseases.—Acreages of Hungarian, French and Pearl millets increased this year, mainly for the birdseed trade.

Pearl millet (*Pennisetum typhoides*) specimens were received heavily infected with a bacterial leaf spot. The causal bacterium was *Pseudomonas syringae*. Another disease which seemed important on this host caused severe yellowing and stunting resembling a virus infection. This disease was severe in a Yanco crop; 90 per cent of the plants showed symptoms.

Hungarian millet (*Setaria* sp.) specimens showing severe leaf and head blast caused by *Pyricularia grisea* came from two areas. Smut caused by *Ustilago crameri* was identified on this host; while *Sphacelotheca destruens* was present on French Millet (*Panicum miliaceum*).

Rice Diseases.—No parasitic rice disease was recorded. The bacterial blight recorded in the glasshouse at Yanco Agricultural Research Station last year has not been observed again. It has apparently been eradicated.

Diseases of Pasture Plants and Field Crops

Diseases of Grasses.—Ergots were more common than usual, favoured by the moist season. High moisture favoured *Paspalum distichum* growth in the north-west and it became heavily infected with *Claviceps paspali*. There were reports of poisoning of cattle by this ergot, but the animals recovered when moved to paddocks free from *Paspalum distichum*.

Blind seed disease (*Gloeotinia temulenta*) of ryegrass was recorded for the first time in N.S.W., in a perennial ryegrass seed sample from Goulburn. Ryegrass seed has been imported for many years from countries where the disease occurs, and the disease has probably been here for some time.

Cause of kikuyu decline on the north coast has still not been determined. Attempts to transmit the condition have so far failed.

Occurrence of a 100 per cent infection of smut, *Ustilago bullata*, in a sown stand of prairie grass (*Bromus unioloiodes*) has pointed to the importance of control of seed borne infestations of this fungus. It has been recommended that seed samples found to be carrying the smut be treated with an organic mercury compound, preferably one with a vapour action.

Turf.—Examination of unthrifty couch has again shown that spiral nematodes are very common in the soil, but without evidence that they are feeding on the grass roots.

The fungus causing blackening of the stolons and roots has again been isolated several times. In the absence of spores its identity still remains unknown.

Clover Diseases.—A survey of the Lismore district and examination of other areas has shown that root knot nematodes (*Meloidogyne* spp.) are widespread on clovers on the central and north coasts. They are obviously the cause of poor establishment and persistence in some areas but their role is not clear in all areas.

In addition to root knot nematodes, all examined soils from clover stands contained free living nematodes in general that include plant parasites. The problem of nematode injury to clovers has therefore become the subject of a more intensive investigation.

White clover, perennial habit and shallow rooting, seems to be damaged most severely in summer. The nematodes are presumed most active then. Annual clovers, which grow during the autumn, winter and spring, are less affected.

Attempts to identify the root-knot nematode species involved have so far not been quite successful. The perineal patterns frequently appear to be intermediate between those of species described overseas and perhaps more than one species are sometimes present on the one root system.

Lucerne Diseases.—Unthriftiness of lucerne on the N.S.W. coast may have many causes. Surveys have shown that generalization is impossible. Investigation of the role of plant parasitic nematodes in damaging this crop will continue, in conjunction with the clover work already mentioned.

Lucerne plants grown in pots in soil in which "forked-root" occurred in the field failed to develop the typical condition. However, further examination of young plants in the field lent support to the hypothesis that the condition developed after the death of the lower part of the tap root, following root-knot nematode and/or fungal invasion.

Other Pasture Legumes.—New records for the year have been a *Cercospora* leaf spot of *Glycine javanica*; crown rot (*Sclerotinia sclerotiorum*) of *Dolichos biflorus*, and root knot (*Meloidogyne* sp.) of *Lotononis bainesii*. These legumes are all believed to show promise for the north coast of N.S.W., but it remains to be seen whether the diseases will prove to be of any consequence.

Tobacco Diseases.—No research work was done this year.

Diseases of Vegetable Crops

Potato Seed Certification.—Records completed by Division of Plant Industry showed that one crop of potatoes submitted for certification during the 1961-62 season was rejected because of excess virus leaf roll content. It was a two-acre crop of the new variety Bungama, at Millthorpe, and had 10 per cent leaf roll infection. No other crop submitted for certification on the Central Tablelands nor any crop submitted on the Northern and Southern Tablelands was rejected for excess leaf roll content.

Leaf roll infections varying from light to heavy were found in the Department's seed increase plot and preliminary yield trial at Orange and in the district variety trial, King's Plains.

In the Millthorpe crop, and the Department's seed increase plot and yield trial, populations of the aphid vectors (*Macrosiphum euphorbiae* and *Myzus persicae*) of leaf roll were found on many plants. So, on co-operation with Entomology Branch and the Division of Plant Industry, action has been taken to protect the Department's seed increase plot and preliminary yield trial at Orange, and the district variety trials located on growers' properties, from leaf roll infection following build-up of aphid vector populations.

Late Blight (Phytophthora infestans) of Potato.—The wet autumn favoured attack by this disease in potato crops at Maitland and in the near Sydney areas. At Maitland there were light to moderate losses, but about 20 per cent loss in crops in the Windsor and Richmond sections of the near Sydney areas.

In co-operation with Division of Plant Industry the project for development of potato varieties immune to late blight has continued. This year's results showed that 27 agronomically promising seedlings were immune to race "O" of *P. infestans*. Twenty-five of these were from the American, blight immune parents: Saco (3), Kennebec (3), Merrimack (10), Cherokee (2), Delus (2), Canso (1), B5922-6 (2) and B595-76 (2); and two were from the Scottish seedlings 1,928 (c)2 and 2,079(ab)7.

Common Scab (Streptomyces scabies) of Potato.—Work in co-operation with Division of Plant Industry for the development of scab resistant varieties has continued. This year in the crossing programme at New England Agricultural Research Station, the scab resistant varieties Alcea, Concita, Antigo, Emilia, Ontario, Osage and Redskin and the seedlings B595-76 and X927-3 were used as parents in a wide range of crosses with varieties and seedlings of good agronomic type.

Second, third, fourth and fifth year seedlings having in their parentage the scab resistant varieties and seedlings, Redskin, Cherokee, Menominee, Osage, Ontario, Seneca, B595-76, B3429-23 are being increased at the Clareveaux Sub-station and at Red Range on the Northern Tablelands.

Rugose Mosaic (Potato virus X + Potato Virus Y) of Potato.—Four agronomically promising Departmental seedlings were tested for their reaction to Potato Virus Y (PVY) following aphid inoculation in the field. These seedlings were S2869, S2879, S2882 and S2883. All were from the cross Monak x 11-79. The parent 11-79 is immune to Potato Virus X (PVX). It did not prove possible to infect the seedlings with PVY. However, the four seedlings were shown to be susceptible to PVX.

Gangrene (Phoma solanicola) of Potato.—This has been known to be present in Victoria since 1953. There it causes a storage rot of tubers in some seed-producing areas. As the disease had not been recorded in N.S.W., in spite of extensive importations of seed potatoes from Victoria over a number of years, action may be needed to prevent N.S.W. importation of Victorian potatoes. Accordingly, a survey was done in N.S.W. seed-producing areas late in 1961, to determine if gangrene were present as a storage rot of seed potatoes.

The survey showed the disease present on two properties at Crookwell, on the Central Tablelands. The disease was not detected in seed lots examined from Cotta Walla, Batlow, Williigobung, Robertson, Yethholme, Mudgee, Running Stream, Orange, Millthorpe, Spring Hill, Forest Reefs, King's Plains, East Guyong and Blayney.

It seems that gangrene is a minor storage rot of potatoes in N.S.W., and it is not yet evident that any special control measures are necessary. Restriction of importation of Victorian potatoes into N.S.W. does not seem necessary.

"Witches' Broom" Disease of Potato.—It appeared for the first time in potato crops in N.S.W. in the 1960-61 season and caused some rejections from certification of crops in the Central Tablelands. In the 1961-62 season, no Tableland crop was rejected from certification because of excess content of this disease. Less than one per cent of the disease was seen in a small crop of Sebago and Sequoia at Orange, and five per cent incidence was recorded in a commercial crop on the Northern Tablelands.

Work so far done on the disease has not shown a pathogenic organism.

Yellow Top of Tomato (Virus).—Moderate infections were recorded in some north coastal crops, but incidence in all coastal areas was generally less than in previous seasons. Route application of systemic organic phosphate insecticides to prevent breeding and spread of the aphid vector is increasing among coastal tomato growers.

For the first time yellow top has been recorded in the south-west, in a home garden at Wagga Wagga. Apart from coastal areas, yellow top had previously been recorded at Bathurst, Central Tablelands; Coonabarabran, North Western Plains; and Tenterfield, Northern Tablelands.

At Dural, near Sydney, two crops were sprayed at 7-10-day intervals with meta-iso-systox (M.I.S.) at 0.015 per cent, and a nearby crop was sprayed at the same intervals with rogor 0.02 per cent. The two crops treated with M.I.S. contained respectively 10.2 per cent and 3.9 per cent yellow top infected plants when fruit picking commenced. The crop treated with rogor showed 3.3 per cent yellow top infection at that time.

In a trial at the Horticultural Research Station, Narara, plots receiving weekly high volume application of rogor (0.2 per cent) showed an average of 5.4 per cent yellow top at the end of the growing period. Plots treated weekly with rogor at the rate of 1 fl. oz. per 2 gallons, by misting machine, averaged 13.5 per cent infected plants at the end of the season.

At both Dural and Narara, the systemic aphidicides had controlled the plant to plant spread of the disease. The individual infections were due to visitation by infective aphid vectors from outside the crop.

An experiment at Rydalmere tested the effect of yellow top infection of seedlings (at the first true leaf stage of growth) on flower formation and fruit set. The infection caused an overall reduction of 48.5 per cent in flower production per hand, and of 71.5 per cent in the mean percentage fruit set. Depression of flower formation and fruit set increased on each successive hand formed.

Tomato yellow top virus is not seed borne in tomatoes, but viability of seed harvested from infected plants has not been known. This year, in an experiment, seed from infected plants in four localities did not significantly differ in percentage germination from seed harvested from healthy plants.

Spotted Wilt of Tomato (Virus).—Early in summer, spotted wilt was epidemic in many Gosford crops. A 70 per cent infection was recorded in one crop which had bi-weekly sprays of 0.1 per cent D.D.T. Spotted wilt was present in many tomato-growing areas, but infections were generally light.

Fusarium Wilt (Fusarium oxysporum f. lycopersici) and Verticillium Wilt (Verticillium dahliae) of Tomato.—Cultures of these fungi were supplied to Division of Plant Industry for use in the programme of breeding varieties resistant to these pathogens. *Fusarium* wilt resistant tomatoes bred at Yanco Agricultural Research Station were not affected by this disease in the M.I.A., whereas susceptible varieties were severely affected.

Leaf Mould (*Cladosporium fulvum*) *of Tomato.*—There were heavy losses in glasshouses at Warriewood and Mona Vale during the late spring of 1961, in crops where recommended control measures had not been applied. Effective control was obtained by a grower who applied polyethylene thiuram disulphide (75 per cent wettable powder) at strengths of 1 lb. per 40 gallons water and 1½ lb. per 40 gallons water to plants at 7-10-day intervals. Control was slightly less efficient where the spray was at ¾ lb. per 40 gallons water. Control from a programme of each of the three concentrations was better than that from a 7-10-day schedule of alternate 25 per cent salicylanilide (1½ pints to 40 gallons water) or 65-78 per cent zineb (1 lb. per 40 gallons water), although control from the latter was good.

Asparagus Decline and Replant Problem, Gundagai.—The cause of declining yields and the death of new plantings of asparagus on old asparagus ground in a 1,000-acre commercial planting on the Murrumbidgee River flats at Gundagai is now under investigation. The earliest planting (100 acres) on this area was made in 1946, and during the last 2-3 years of its life the production markedly declined. A 6-acre section of this area was replanted in 1959, and in the last two years over 50 per cent of the plants have died. A further 700 acres are due for replanting in the next 4-5 years.

Field examination of dead and dying plants showed considerable rotting of feeder and storage roots, crown rot, flecking of spears, and wilting of ferns. It was caused by a strain of *Fusarium oxysporum.*

A programme of selection of and breeding from any surviving plants, and a long-term rotational trial, have been started in co-operation with the company, in an effort to control the disease.

Bean Seed Certification Scheme.—In co-operation with Division of Plant Industry, the Bean Seed Certification Scheme continued for the 19th successive season.

Of 41 crops inspected, nine were certified and two were approved. Of the 30 crops not certified or approved, 12 were rejected because of anthracnose, one because of halo blight, five for lack of isolation, one for excessive weed growth; one crop was lost because of rain and nine were picked for green beans. One crop was rejected because the grower was unable to supply particulars of seed origin.

The varieties certified included Hawkesbury Wonder, Wellington Wonder, Tweed Wonder, Brown Beauty, Redlands Belle and College Early. Those approved were the canning varieties Pearlgreen and Tendercrop.

Only small areas were certified and yields were low, mainly due to unfavourable weather and disease outbreaks.

Bean Anthracnose (*Colletotrichum lindemuthianum*).—This continues to be one of the most prevalent and serious diseases of beans. Numerous outbreaks were reported from coastal areas. Incidence was greater than usual in the south coast seed-producing areas.

Ashy Stem Blight (*Macrophomina phaseoli*) *of Beans.*—This caused widespread and severe losses to bean crops grown for deep freezing and canning in western and south western districts in 1962. Late summer and early autumn weather provided the high temperature and low soil moisture conditions known to favour the disease. Losses were also reported in the previous season from some western districts, but prior to this the disease had not been a problem.

Rockmelon Powdery Mildew (*Oidium sp.*).—This is still the most serious rockmelon disease in the M.I.A. and the Lower Murray district.

Since the breakdown of resistance of the varieties P.M.R. 45, P.M.R. 5, and P.M.R. 6, the disease has at first become evident late in the growing season, in mid-February. Damage has increased as the season progressed. In the 1961-62 season it was first observed in mid-December and it severely damaged the early rockmelon crops. These had escaped in previous years.

Weather records for Griffith district indicated that in the 1961-62 season heavy dewfall occurred every month for the entire season, whereas in previous years dewfall usually ceased after November and was not recorded again until February. There was also a tendency to lower temperatures in the 1961-62 season than in previous years. These factors may have favoured the early and prolonged incidence of the disease.

F_1 plants produced by Division of Plant Industry at the Yanco Agricultural Research Station were inspected. These crosses were derived from some of the melons of Indian origin obtained from California during 1960 (as a source of powdery mildew resistance), and the varieties Harvest Queen and Delicious 51 (as a source of *Fusarium* wilt resistance). The variety Spartan Rock has been discarded as a source of *Fusarium* wilt resistance because of an internal breakdown of the fruit. This occurred for several years.

Plantings of the varieties P.M.R. 45, P.M.R. 5 and P.M.R. 6 at Rydalmere were again reistant to the disease, indicating that the strain of the fungus at Rydalmere is different from that in the south west. Well developed fibrosin bodies said to be present in *Sphaerotheca fuliginea* but not in *Erysiphe cichoracearum* were found in all specimens of cucurbit mildew examined, from inland and coastal areas.

The variety Rio Gold was not uniformly resistant at Rydalmere. One plant in every eight showed infection.

Attempts to induce formation of the perfect stage necessary for definitive identification of the fungus have been unsuccessful.

Extensive tests of fungicides against Rockmelon powdery mildew were conducted at Rydalmere and Griffith.

The tests compared fungicides, sprays and dusts, compared weekly and fortnightly intervals of application, compared high volume and low volume sprays, misting machines and knapsack equipment, etc. Resutls will be recorded elsewhere.

Cucurbit Gummy Stem Blight (*Mycosphaerella melonis*).—For watermelons the control measures now advised are crop rotation and spraying with zineb 1½ lb. to 80 gallons of water, as for anthracnose. Mercuric chloride seed treatment has also been suggested.

The fungus was recorded for the first time on cucumber in the spring of 1961, isolated from apple cucumber fruit, stems and petioles.

All previous records of this disease have been in coastal districts north of Sydney, but in 1962 in the Lower Murray district it caused profuse exudation of gum from the surface of pumpkin fruit, followed by a slow dry rot.

Cucurbit Anthracnose (*Colletotrichum orbiculare*).—Several outbreaks occurred in the M.I.A. and the Lower Murray district. Conditions were wetter and more humid than normal early in the season.

Cucurbit Downy Mildew (*Pseudoperonospora cubensis*).—It severely damaged crops of cucumbers and rockmelons on the North Coast in the spring of 1961 and in the near Sydney areas in the autumn of 1962. Abundant rainfall in these periods favoured it. Several moderate to severe infections of the cucumber varieties Ashley and Stono were observed. They were at variance with results of a variety trial conducted by a commercial seed producer, reported in 1960, wherein Ashley and Stono were highly resistant. These varieties are widely grown and popular.

Pea Stunting and Rosetting.—This disease appeared for the first time in N.S.W. in the 1960-61 season, when it caused heavy losses in canning pea crops on the central tablelands. The cause has been shown by the C.S.I.R.O. Division of Entomology to be a virus. It is transmitted by a number of aphid vectors.

The disease again appeared in pea crops in this area in the spring and early summer of the 1961-62 season. Prompt application of aphicides to the crops, using aircraft and ground equipment, kept incidence of the disease down to less than ten per cent. in infected crops.

Sclerotinia Rot (*Sclerotinia sclerotiorum*) *of Vegetables.*—There is no fungicidal recommendation for control of this disease. It causes widespread losses in ornamental and fruit crops as well as vegetables; and is particularly serious in beans and tomatoes on the North Coast in winter.

Overseas reports have indicated soil treatment pentachloronitrobenzene (P.C.N.B.) to be of value. A test of its efficiency was made at Terranora Vegetable Demonstration Plot in co-operation with Division of Plant Industry. The fungicide was applied at the rate of 100 lb. of active ingredient per acre and thoroughly mixed to a depth of four inches. No conclusion could be reached, as the disease did not develop either in the treated or untreated sections.

Inspection of another crop where the fungicide had been applied as a soil treatment at the rate of 15 lb. active ingredient per acre in an 8 in. band over the row at sowing indicated that it was not highly effective. About one-third of the crop was affected by the disease. Previous cropping history of the land indicated that only very limited inoculum in the form of sclerotia could have been present. Occurrence of the disease following wet weather at flowering suggested that infection, at ground level, came from ascospore infection of the fallen petals covering the ground at the base of the plant and touching the stem.

In a North Coast survey in July, 1961, to determine the relative importance of direct mycelial growth from sclerotia in the soil and of ascospores as the cause of infection, bean plants mostly were infected at the ground level, whereas in tomato plants the disease was mostly on the aerial parts.

Apothecia were observed on one occasion only in the North Coast survey. They were in an old bean crop, affected by the disease several weeks prior to its inspection.

Use of Misting Machines.—Statistical analysis of the results of the 1960-61 experiment at the Horticultural Research Station, Narara, has shown no significant difference in control of early blight fruit rot (*Alternaria porri* f. sp. *solani*) of trellised tomatoes between the following three treatments at weekly intervals:—

(*a*) High volume application of copper oxychloride, 8 oz. per 20 gallons water, till commencement of fruit ripening, then 12 oz. per 20 gallons.

(*b*) Application by misting machine of copper oxychloride, 8 oz. per 2 gallons water, till commencement of fruit ripening, then 12 oz. per 2 gallons, and

(*c*) Application by misting machine of copper oxychloride, 4 oz. per 2 gallons water, till commencement of fruit ripening, then 6 oz. per 2 gallons.

The relative rates of deposition of copper on the leaves and stems of the plants were determined by the Chemistry Branch. Significantly greater amounts of copper were deposited by treatment (*b*) than treatments (*c*) or (*a*). Treatment (*c*) resulted in significantly greater copper deposit than treatment (*a*).

Because these findings indicated that the copper deposits from the treatments bore no relationship to early blight fruit rot control, treatment (*c*) was accepted temporarily as the standard misting treatment for trellised tomato crops.

Work continued in the 1961-62 season. Aspects studied were:—(1) Is it necessary to increase the concentration of copper oxychloride when the fruit commences to ripen, and (2) What is the effect of halving the lowest concentration of copper oxychloride applied by misting machine in the 1960-61 season?

The 1961-62 results have yet to be statistically analysed, but highest yield of clean fruit was obtained where a high volume application of 8 oz. per 20 gallons throughout the life of the crop, or a mist application of 4 oz. per 2 gallons throughout the life of the crop, was used. The Chemistry Branch has again co-operated in assessing the relative copper deposit on leaves and stem from the various treatments and also assessing the relative efficiency in distribution of copper deposit. The results of this are not yet available.

Mushroom Diseases

Surveys this year showed: The trend towards controlled indoor culture is continuing; some further increase in use of disused railway tunnels for mushroom culture; more growers are using chlorinated water as a routine preventative measure against some fungus and bacterial diseases; and spawn supplied by commercial mushroom spawn producers continues to be of high quality.

Mat Disease (*Myceliophthora lutea*).—This was recorded five times this year in the Sydney area. It caused yield losses of up to 50 per cent. On properties where mat disease has occurred but where there are facilities for formalin-steam sterilization treatment, the disease has been brought under control.

Eelworms.—Rhabditis complex caused serious yield loss in many crops in the Sydney area and on the South Coast. Losses were associated with lack of peak heating facilities, or inadequate peak heating of the composted manure-straw mixture. The eelworms, natural inhabitants of animal manures, multiply rapidly in unpasteurized compost. In two cases, eelworm infestation was due to use of contaminated peat as a bed casing.

Fungus Disease.—"Lipstick" mould (*Geotrichum* sp.) and *Acremonium* spot were recorded for the first time in N.S.W. Each was in the Sydney area. Neither caused serious loss.

Citrus Diseases

Crops were again good to heavy in all areas. Losses due to black spot were light. There was no report of loss from *Septoria* spot. Through the wet spring and early summer, melanose and mandarin brown spot were hard to control in coastal orchards. Some brown rot occurred in central coast orchards in May and June.

Aphid-transmission of a Virus

In controlled glasshouse conditions at Division of Science Services laboratories, Rydalmere, this plant pathologist has transferred from a diseased to a healthy plant some aphids carrying rose wilt virus. The tests showed that this disease can be transmitted to young rose plants by the common rose aphid.

Phytophthora Diseases.—Conditions favoured development of root and shoot rots caused by *Phytophthora citrophthora* in nurseries in the Sydney area. Losses in some cases were high. Losses of trees on rough lemon stock continue, a result of periodic flooding over the past 12 years. In Narromine district thousands of trees have been removed and others are reaching an unprofitable stage. Deterioration of old trees is also continuing in the M.I.A.

Seedlings of a number of mandarin varieties and trifoliata hybrids for resistance to *P. Citrophthora* were tested, with the following results:—

Immune to highly resistant—

Poncirus trifoliata—22.

Yanco hybrid R18 T11 (trifoliate type).

Yanco hybrid R18 T5 (trifoliate type).

Yanco possible hybrid R18 T8 (blood orange type).

Troyer citrange.

Narara hybrid (Cleopatra mandarin x *P. trifoliata* 3784).

Narara hybrid (Cleopatra mandarin x *P. trifoliata* 3782).

Narara hybrid (Cleopatra mandarin x *P. trifoliata* 3783).

Resistant (rotting restricted to feeder root tips)—

Carrizo citrange.

Scarlet mandarin, Narara, old tree.

Scarlet mandarin, Everingham.

Solid scarlet mandarin, I.B.

Yanco hybrid R18 T6 (trifoliate type).

Yanco hybrid R18 T23 (trifoliate type).

Yanco hybrid R18 T9 (trifoliate type + 1/20 unifoliate).

Yanco possible hybrid R18 T20 (blood orange type).

Moderately susceptible (feeder roots rotted, slight rotting of main roots)—

Cleopatra mandarin, 2069.

Cleopatra mandarin, R. Hollins.

Susceptible (moderate attack on main roots)—

Cleopatra mandarin, S. F. Keanan.

Rough lemon.

Slight differences in the susceptibility of Cleopatra mandarin from different sources were shown. The relative resistance of Scarlet mandarin, previously noted, was confirmed. A very promising degree of resistance was found in a blood orange type (possibly a hybrid) from Yanco.

Virus Diseases.—The work was collaborative with officers of the Division of Horticulture.

Grapefruit Stem Pitting.—Fruit symptoms shown by some clones selected for mild strain protection were slightly more marked than in the previous two years. This is not thought to be due to a break-down in protection but to the influence of seasonal conditions on expresson of symptoms by the strain present. Presence of a mild strain was found to give no protection against a severe strain introduced by budding. Seven mild strain selections were tested in this way.

Scalybutt (Exocortis) and Stunting of trees on Poncirus trifoliata.—Observations continued in experiments designed to measure interaction between scalybutt and stunting. Transmission of a factor which stunts trees on *P. Trifoliata* without causing scaling has been established. Two cases of field spread of scalybutt to old trees previously free of this disease were recorded in an orchard at Dooralong.

Observations continued on the types of scaling symptoms developing on infected mature trees of Washington navel on trifoliata stock in a number of orchards.

Sudden Death.—Observations continued. Some seedling trees inoculated with the suspected pathogen were top-worked with orange or lemon varieties, to determine whether development of the disease could be hastened.

Black Spot (Guignardia citricarpa) Fungicidal Comparisons.—The orchard trial of seven promising fungicides continued on an acre of large Valencia orange trees, on light sandy soil at Mangrove Mountain.

Excellent control was obtained with all treatments in a season with about 40 per cent severe black spot in non-sprayed plots. The mean level of clean fruit for the four leading treatments was 96.0 per cent. The mean level for the remaining three treatments was 92.8 per cent. Differences in black spot control between programmes of zineb, cuprous oxide, copper oxychloride and weak Bordeaux mixture were not shown.

Zineb treated fruit (2½ lb. per 100 gallons) had at harvest the most attractive colour, appearance and freedom from surface blemish. But juice content was seriously reduced by this programme. It was 25 per cent below the level of non-sprayed fruit. Skin thickness was 50 per cent greater and yield of fruit the lowest for all treatments.

Cuprous oxide sprays produced fruit with the highest juice and solids content. Yield of fruit per acre was very high. On the other hand, fruit size was the smallest for all treatments and surface blemish to the rind was very severe.

Bordeaux spray programmes generally produced fruit with a much lighter bushel weight—16 per cent less than non-sprayed fruit. Yields were consistently high, except where the first Bordeaux mixture-oil application was combined with wettable sulphur at petalfall. This reduced yield.

Copper oxychloride sprays produced fruit with reasonably high juice and solids contents. Fruit size was normal but yield per acre was about 18 per cent below that obtained with the weak Bordeaux mixture programme. Surface blemish and spray injury on fruit was severe.

Nett return per acre for fruit was highest with the standard Bordeau-oil programme. Returns were least for the cuprous oxide sprayed fruit and the zineb treated was only slightly better.

In co-operation with Division of Horticulture, the two black spot spraying trials continued in the Dooralong-Jilliby districts. Funds for these tests were again provided by Wyong Co-operative Citrus Packing House Ltd. The purpose was to compare the efficiency of the currently recommended Bordeaux mixture with a number of proprietary fungicide materials that have given promise in controlling this disease with mature Valencias of comparable age, (i) on trifoliata stock, and (ii) on rough lemon stock.

At Jilliby three spray programmes of 18 different treatments were compared on trees on rough lemon stock. Disease control, yield, fruit size, surface blemish and aspects of fruit quality were assessed.

The trees carried very good crops and the non-sprayed trees developed a mean 68 per cent severe disease at harvest. But good control of black spot disease was given by most of the treatments. The four best treatments, cuprous oxide, zineb, copper oxychloride, and a mixture of zineb with copper oxychloride, respectively yielded a mean 94.1 per cent of clean fruit. Melprex (R) and Glyodin (R) failed to control either black spot or melanose in this trial. The remaining twelve treatments, various fixed copper fungicides, gave a mean 80.1 per cent of clean fruit.

Fruit marking due to wind injury was very severe in this experiment. Hence, sprays which blackened or accentuated this injury could be readily compared. Most of the fixed proprietary copper materials, cuprous oxides, copper oxychloride and zineb-copper oxychloride mixtures severely blackened the wind rub damage on fruit. They were considerably worse in this respect than weak Bordeaux mixture.

With trees on trifoliata stock on heavy alluvial soil, the zineb programme gave excellent control of black spot and melanose. It produced fruit with excellent colour, freedom from blemish, reasonable skin thickness and internal fruit quality, comparable with non-sprayed fruit. As well as these favourable aspects of fruit quality, yield was not reduced (cf. zineb on lighter soils).

The most satisfactory copper fungicide for disease control, freedom from surface blemish, and evenness of fruit colour, was a proprietary brand of cuprous oxide. On the other hand the greatest reduction in yield and down grading due to surface marking was caused by a second proprietary brand of cuprous oxide.

Excellent black spot control was obtained with the zineb programme at Dooralong applied to trees on rough lemon rootstock. External fruit quality was highly satisfactory but skin thickness was greater and the central core tended to be loose and open. One undesirable feature was a 25 per cent reduction in yield with zineb applied to Valencia orange trees on rough lemon rootstock on the lighter soil type.

With the co-operation of Division of Horticulture these trials were demonstrated to interested citrus growers and representatives of trade organizations.

In a screening trial at the Horticultural Experiment Station, Narara, some fungicides were tested for efficacy in comparison with Bordeaux mixture in controlling black spot on mature Valencia orange trees. The materials compared included Delan (R), copper oxychloride, copper oxychlosulphate, maneb, Cuprazin (R), ziram, Phaltan (R), captan, thiram, Glyodin (R) and Phenyl mercuric chloride. Bordeaux mixture gave the most satisfactory black spot control (81 per cent clean), with Delan (R) next (75.0 per cent), followed by copper oxychloride (69.0 per cent). Glyodin (R) sprays gave practically no control, and thiram, captan, Phaltan (R) and ziram provided only indifferent control. Phaltan (R) and Delan (R), when applied with white oil, caused severe fruit injury. Maneb on the other hand produced large fruit of outstanding external appearance, but the skin proved to be rather thick. Trees sprayed with phenyl mercuric chloride had their crop reduced by two-thirds, whilst the remaining fruit was pale, immature and misshapen. Some leaf and twig injury was caused by this spray application.

Low volume aqueous mist applications of zineb and copper oxychloride both with and without white oil as an additive, were compared with full volume Bordeaux mixture applications at the Experiment Station. Again Bordeaux mixture gave superior black spot control, followed by the low volume applications of copper oxychlorides. Only indifferent disease control was obtained by low volume applications of zineb. White oil additive to low volume copper oxychloride mists improved black spot control, but had no effect on efficiency of zineb mists.

Excessive fruit marking was caused by mist application of copper oxychloride. On the other hand excellent colour and external fruit quality resulted from mist applications of zineb. Oil additive to the zineb mist caused skin texture to coarsen considerably, with decided enlargement of oil glands.

Co-operation with the Citrus Wastage Laboratory in testing post harvest dips to control black spot of Valencias has continued.

Etiology and Control of Brown Spot of Emperor Mandarin.—Inoculation studies continued, with a pathogenic strain of *Alternaria* sp. isolated from a number of citrus hosts. Confirmatory evidence has been accumulated regarding this fungus as cause of brown spot disease of Emperor mandarins.

Laboratory experiments had been carried out to test the efficiency of a number of fungicidal materials on this species of *Alternaria*. Macrospore germination was prevented by the following concentrations of fungicides—captan (0.10 per cent), Melprex (R) (0.125 per cent), Glyodin (R) (0.025 per cent) and thiram (0.12 per cent). As well, phenyl mercuric chloride (0.025 per cent), sodium ortho phenyl phenate (0.5 per cent) and thiram (0.12 per cent) had a definite eradicant action on the fungus. Lime sulphur (1-12) also had some eradicant action.

Citrus Nutrition Experiment.—The long-term citrus nutrition pot-experiment at Gosford Citrus Experiment Station continued in co-operation with Chemistry Branch and Division of Horticulture. Quantitative results for the second year harvest have confirmed many of the relationships and findings obtained with the first year's harvest. Main effects of nutrients influencing yield, tree health, and fruit quality have been studied, as well as effects of interactions of nutrients on these aspects.

Diseases of Deciduous Fruits

Eradicant Control of Apple Black Spot (*Venturia inaequalis*).—Conditions highly favoured infection in many areas, but control of the disease was generally satisfactory. This was due in part to the increasingly widespread adoption of an *eradicant* post-harvest spray (phenyl mercuric chloride) released by this Department in 1960.

The effect of phenyl mercuric chloride (P.M.C.) on saprophytic development of *Venturia inaequalis* and subsequent ascospore production was further investigated.

Application of a 0.01 per cent suspension of P.M.C. to the lower surface of senescent black spot infected apple leaves was as effective in preventing saprophytic development of *V. inaequalis* as was application of 0.01 per cent P.M.C. to both surfaces. Each treatment went close to 100 per cent (e.g. ranging from 94.8 to 100 per cent, through 13 samples). Treatment on the upper surface only was relatively ineffective (ranging from nil to 75.6 per cent through five samples).

Addition of surface active agent Glyodin (R) had no consistent influence on efficiency of the 0.01 per cent P.M.C. treatment.

Attempts to remove or reduce P.M.C. deposit by leaching with simulated rain at intervals between one hour and ninety-six hours after the spray had dried on the leaves failed to reduce the 100 per cent effectiveness of 0.05 per cent P.M.C. treatment. Similarly, where 5 per cent glycerol was added to the spray to prevent drying, leaching one hour after treatment did not reduce the effectiveness of the P.M.C. It suggests that eradicant effect may be achieved quite rapidly.

Results of the leaching experiment, considered with the efficiency of P.M.C. applied only to the lower surface of infected leaves, indicate that an apple grower who has thoroughly sprayed the lower surface of the leaves on his trees is assured of satisfactory reduction in inoculum despite rain immediately after the spray has dried.

Inconspicuous sparse infections on the lower surface of leaves were shown capable of a substantial number of ascospores.

Lime Sulphur Spray Effect on Apple Cropping.—At the Glen Innes Agricultural Research Station a seven years' project in co-operation with Division of Horticulture, to investigate the lime sulphur and thiram effects on apple yields in the absence of black spot, has been completed. The results will be reported later.

Bitter Pit of Apple; Control by Calcium Nitrate.—Effect of calcium nitrate on incidence of bitter pit of the early maturing Willie Sharp apple has been investigated. A single spray application at 5 lb. per 100 gal. in early December was as effective as three sprays (early November, early December and early January) or two sprays (either early December and early January or two sprays one week apart in December). Each treatment restricted bitter pit to less than 2 per cent of the fruit. Untreated trees yielded 8.9 per cent affected fruit. Statistical analysis has shown the differences to be significant.

These results will be the basis of a recommendation for treatment of early maturing apple varieties with a single spray of calcium nitrate 5 lb. per 100 gal. in December.

Apple Bitter Rot (*Glomerella cingulata*).—The coastal season was extremely wet and there were severe losses from bitter rot, particularly in Willie Sharp, Granny Smith and Peasgood Nonsuch. A laboratory, fungicide screening experiment was conducted. Granny Smith apples were sprayed with various fungicides, before they were spray inoculated with a spore suspension of *Colletotrichum gloeosporioides*. Captan, Phaltan (R) and zineb were the most effective of ten fungicides tested.

Virus Diseases of Pome Fruit.—Tests continued, at Narara, for transmission of suspected virus diseases (apple measles, apple wood-tumour, pear ringworm and pear fissure-bark). No evidence of transmission of these conditions has yet been obtained. The trees have been retained for further observation.

In 1955 a Williams pear tree at Orange showing symptoms of severe ringworm was grafted with the pear varieties Winter Cole, Josephine, Beurre Bosc, Packham's Triumph and Williams. Examination of this tree this season revealed that the Beurre Bosc and Packham's Triumph grafts had both died. The Josephine graft showed signs of the ringworm condition. Of all the varieties worked onto the tree, Winter Cole has shown best growth.

Gravenstein apple trees on seedling stock, subjected to heat therapy immediately after grafting, in an attempt to free them of apple flat-limb virus, have been kept under observation. The two trees which survived the heat treatment were planted at Bathurst Experiment Farm. One of them has died. The other is still growing. No definite symptom of the virus disease has been noted on it. Eight trees have been worked on seedling stock at the New England Agricultural Research Station, from the tree at Bathurst. Of these eight trees, three are showing slight symptoms of flat limb and five are still symptomless.

Flat-limb is very widespread in Gravenstein in trees in New South Wales. It is thought that the stock on which this variety is worked may have some affect on the expression of symptoms. Therefore a detailed assessment of 1,070 Gravenstein trees in one orchard at Cobbitty was done. These trees were originally root-grafted onto eleven different stocks. As the Gravenstein wood was selected from trees visually free of flat-limb, the disease could be due to a virus carried in some stocks in a symptomless condition, symptoms being shown only in Gravenstein worked onto them.

The stocks used in this orchard were all seedlings except for one group of a clonal stock, Merton 778, developed at East Malling, England. Incidence and severity of flat-limb on these clonal stocks were much greater than on the seedling stocks.

During November Dr. Posnette of East Malling Research Station visited for two weeks and inspected a large number of orchards. He gave valuable information on virus and virus-like disorders of deciduous fruit trees in this State. As a result, new light has been thrown on many of the virus disease problems and possible means of attacking them.

The work of the Deciduous Fruit Trees Improvement Committee continued. In the consequent orchard surveys several new virus-like conditions were recorded. Transmission tests will determine if they are due to a virus infection. Sources of propagating wood used by nurserymen were also examined. As a result, many trees were rejected. These showed indications of virus infection. A new introduction which had been worked onto an old Jonathan apple tree was rejected for this reason.

A range of indicator plants required for identification of virus diseases of pome fruit is still being assembled.

Stone Fruit Brown Rot (*Sclerotinia fructicola*); *Fungicide Tests*.—Two pre-harvest spray trials tested 20 fungicides. Brown rot affected less than one per cent. of fruit in the test orchards, so no assessment of control was possible.

Two commercial-size demonstrations of the recommended control measures were continued in orchards at Leeton and Griffiths. The results indicated that to achieve control of brown rot the control of oriental peach moth is important. The injuries this pest causes frequently become infected with the fungus.

Addition of a wetting agent to the fungicide was again tested in two field trials. Incidence of brown rot was too low for assessments.

In post-harvest fruit dip tests, Mycostatin 20 ® and experimental compound RD.6584 gave excellent control of brown rot in storage. In addition, RD.6584 gave outstanding control of soft rot (*Rhizopus stolonifer*).

In another test, the experimental fungicide 0-3818B was ineffective as an eradicant of *S. fructicola* during the dormant period.

Stone Fruit Brown Rot Infection Chain.—Detailed observations of the infection chain were made in peach and apricot orchards near Leeton.

Apricots:

(1) There is evidence that bees may be vectors and introduce primary inoculum of conidia into apricot trees at blossoming.

(2) Fruit infections occur throughout the season. They generally follow rain, but in the ripening period rain is not necessary.

(3) About 50 per cent of all infections ultimately involve more than one fruit. The additional fruits are infected by mycelial penetration, either by contact or through the twig. Most of this mycelial penetration occurs shortly after infection.

(4) Increasing numbers of infected fruit fall to the ground as harvest approaches.

(5) About 50 per cent of infestations are due to contact with or proximity to blighted blossoms.

(6) Infection of apparently sound fruit by conidia occurs throughout the season.

(7) There is no simple relationship between blossom blight level and final fruit rot incidence in individual trees.

Peaches:

(1) In many orchards mummified fruit are of little importance as over-wintering infections because this fruit is removed by the grower or falls to the ground and decays.

(2) Conidia overwintering in blossom buds are of doubtful importance.

(3) Bees may carry the primary inoculum in the spring. Carpophilus beetles possibly play no part at this stage.

(4) The first fruit infections (in the variety Golden Queen) appear in mid-January, eight weeks before harvest. Thereafter increasing numbers of fruit become infected.

(5) Rain appears necessary for first fruit infections. However, rain is not essential for infection of ripening fruit. Infection through apparently uninjured epidermis can occur at that stage, without free moisture.

(6) Some single-fruit infections later involve a number of fruit through contact infection. About 80 per cent of infected fruit falls.

(7) Over 80 per cent of fruit infection followed injury by Oriental Peach Moth.

Brown Rot of Stone Fruit; Spore Population Studies.—In preliminary studies, spore concentrations at various distances from a source orchard were measured. A Hirst spore trap showed that concentrations of 1-10 conidia per cubic meter were maintained within about six chains of the affected peack block during the 72-hour test period.

Peach Bacterial Spot (*Xanthomonas pruni*).—This disease has now been recorded in 39 orchards in N.S.W. In an experiment on Blackburn peaches at Darke's Forest, there was no significant difference in bacterial spot incidence between non-sprayed trees (13.3 per cent infected fruit) and those sprayed with 0.073 per cent dithianon, 0.113 per cent dithianon, 200 p.p.m. Agrimycin ®, zinc sulphate-lime mixture 5-10-100, and 0.065 per cent dodine. Very heavy rain was recorded during the course of the trial.

Peach Freckle (*Fusicladium carpophilum*).—Assistance was given to Henry H. York & Co. Pty. Ltd. in planning and assesing a field experiment on Blackburn peaches at Dural. Dithianon was compared with a standard schedule and a non-treated control. The standard schedule comprised copper oxychloride at budswell, thiram at full-bloom, zineb at shuckfall and at monthly intervals, until a preharvest spray of thiram was applied one week before harvesting.

Statistical analysis showed dithianon at either 0.075 per cent or 0.113 per cent to be significantly better than the standard treatment.

Stone Fruit Rust (*Tranzschelia discolor*).—In an experiment at Young, to determine the effect of rust infection on prune yield and quality, only a trace of rust had developed by harvest time.

In the peach freckle experiment at Dural earlier referred to, observations on rust incidence confirmed the previous season's observation that 0.075 per cent dithianon satisfactorily controls peach rust.

Stone Fruit Shot Hole (*Stigmina carpophila*).—In an experiment at Young, in co-operation with Division of Horticulture, a winter spray of 0.05 per cent phenyl mercuric chloride (P.M.C.) failed to provide adequate control of shot hole on almonds, but gave excellent control on apricots. In 1959 at the same location, there had been good control of shot hole on almonds by a winter spray of 0.1 per cent P.M.C.

Cherry Bacterial Canker (*Pseudomonas syringae*).—In a long-range experiment at Orange in co-operation with Division of Horticulture, two susceptible varieties have been worked either high or low on seedling stocks of Malling F12/1 and of Deister. Very little infection occurred this season. Of five trees on which lesions developed, two were infected on the Malling F12/1 stock in the high worked trees, one on the stock only, and one on both stock and scion.

Leaf Curl (*Taphrina sp.*).—Cross inoculation studies were commenced in spring 1961. Isolates of *Taphrina* sp. from apricot and from peach were inoculated into potted apricot and peach trees. No infection occurred this season.

Virus Diseases of Stone Fruit.—Mahaleb cherry trees on Mazzard seedling stock, subjected to heat therapy immediately after budding, have been kept under observation at Rydalmere. As yet, none of the three trees which survived the heat treatment has shown signs of virus infection. One of the non-treated controls has shown leaf enation on the growth from the Mazzard seedling stock. This suggests transmission of cherry rugose mosaic virus from the Mahaleb scion. All six trees will be retained for further observation.

The Deciduous Fruit Tree Improvement Committee continued effective work. As a result of the orchard survey, virus diseases are known now to be fairly widespread, especially in cherry trees.

Observations by Dr. Posnette of East Malling, U.K., during his visit to N.S.W. in November, 1961, indicated that cherry rugose mosaic virus is far more widespread than had been thought previously. He pointed out additional symptoms he considered indicative of cherry rugose mosaic virus. In the survey of stone fruit propagating material, this additional information led to rejection of almost all source trees of cherry budwood at Orange. The remaining source trees are still in doubt and will be indexed.

Diseases of Tropical Fruits

No work was undertaken by the Biology Branch on diseases of tropical fruits on the far north coast this year because of absence (on post-graduate studies in England) of the officer normally at Murwillumbah.

Passionfruit Fusarium Wilt.—Glasshouse and field selection and testing of suitable disease-resistant rootstocks for passion vines have been finalised. Several species of *Passiflora* have been found satisfactory as rootstocks for Gosford district. The yellow passionfruit, *Passiflora edulis* f. *flavicarpa,* has performed extremely well as a stock, but supply and germination of this seed have been problems.

Two papers have been published jointly with the Fruit Research Officer on epidemiology and rootstock investigations.

Work on development of an acceptable resistant hybrid also continued. Hybrid and backcross seedlings in *Fusarium* infested soil in the glasshouse have been tested. Field testing is now in progress on a restricted scale.

Diseases of Grapevines

Downy Mildew.—The work is collaborative with Division of Horticulture.

Almost continual rain in November and early December of 1961 was conducive to downy mildew development and rendered syraying difficult. Some heavy damage was experienced in Hunter River and near-Sydney vineyards.

In demonstration high-volume spray trials at Orchard Hills, Bordeaux mixture 5-5-100 was again superior, in fruit and foliage protection, to all other sprays used. Copper oxychloride and zineb gave satisfactory control, but Trioneb ® and Phaltan ® were unsatisfactory.

Grape Vine Bunch Stem Die-back.—This work is collaborative with Division of Horticulture. Calcium nitrate and calcium chloride at the rate of 5 lb. per 100 gallons were applied as foliage sprays to blocks of Black Muscat vines at Orange. Six applications at approximate fortnightly intervals were made during December, January and February. Incidence of bunch stem die-back was extremely low during the season in this district. No conclusion could be drawn. Slight leaf scald followed use of the chloride sprays.

Root Knot Nematode.—Again the work was collaborative with Division of Horticulture. Infestation of the roots of a number of *Phylloxera*-resistant stocks planted in infested soil at Griffith was assessed. Moderate resistance occurred in 62.66, 420A and 106.8; whereas, Dulot, 101.14 and 3309, were heavily infested. The wine variety Pedro showed moderate resistance.

Fan-leaf.—Successful transfers of a virus thought to be fan-leaf were obtained in November, 1961 to seedling indicators *Chenopodium amaranticola, Datura stramonium* and tobacco. The transfers were from the following sources: Tokay, unsatisfactory vines from Corowa; Hunter River Riesling, vigorous vines from Rooty Hill; Grenache, vigorous vines from Griffith; False Trebbiano, imported from South Australia; Sylvaner, imported from France; ARGI (stock), imported from California; 1613 (stock), imported from California via South Australia; French Colombard, imported from California via Victoria; Doradillo, vigorous vine from Coomealla; and Golden Chasselas, unsatisfactory vines from Rooty Hill.

Not all the affected vines are of low vigour. Therefore, it is possible that there are strains of fan-leaf almost without effect on vine growth, or that fan-leaf effect is (like tristeza of citrus) most manifest in certain stock-scion combinations.

Diseases of Ornamentals

The most common cause of loss among ornamentals this year was root-rot. Many gardens did not have adequate drainage to cope with the excessive rain. Many shrubs, trees and herbaceous plants were lost as a result.

Carnation Wilt (Fusarium oxysporum f. dianthi) and Branch Blight (Alternaria dianthi).—These were the most common causes of carnation losses. Neither is easy to control and damp conditions favoured the fungi. Care in selection of planting site and propagating material still appear the only satisfactory methods of avoiding high incidence.

Phytophthora Root Rots.—These caused losses in a commercial planting of Australian Christmas Bush. They were also suspected in the death of cypresses, pines and daphne. All these require well-drained soil. The fungi grow rapidly in wet soil.

Rose Wilt (Virus).—This caused heavy losses in some nurseries in the spring. Laboratory tests have shown that it can be transmitted to young roses by the common rose aphid *Macrosiphum rosae.* The field significance of this has to be determined.

American plant pathologists have suggested that confusion of *Verticillium* wilt and virus wilt of roses may occur. Attempts to isolate *Verticillium* from plants showing characteristic symptoms of the rose virus wilt were consistently negative.

Apart from rose wilt, other symptons suggestive of virus infection have been noted this year, including flower break and a twisting, mottling and general malformation of the leaves The latter disease was shown to be transmissible by budding.

Leaf Gall (Exobasidium vaccinii).—This was frequently recorded on azaleas and camellias in the metropolitan area Infection of a specimen of *Camellia sasanqua* was noted with interest. It is not often found on this species.

Bacteriology Section

Dairy Products Bacteriology

Cheese Starters.—During the year 1,031 starter cultures were distributed to the industry. The ability of factory personnel to maintain and propagate these strains of bacteria appears to be well established in most factories.

Bacteriophage infection of starter remains the most important single factor in culture failure, but occurs only infrequently in those factories with approved water sealed lids on bulk starter cans or bulk starter units.

Eleven cheese factories were visited in the past year to advise on culture propagation and rotation.

Cheese Quality Survey: Staphylococcus aureus.—The research outlined in the 1960-61 report on the incidence of *Staphylococcus aureus* in cheddar cheese was continued, and a report on the programme was published.

It was found that the curing of raw milk cheddar cheese for a period of sixty days was inadequate to free the cheese from this organism. As a result of this research, all cheese factories in New South Wales have installed suitable pasteurisation equipment, capable of heat treating all milk for cheese manufacture to a temperature of 162°F. for a period of 15 seconds. This will enable New South Wales manufacturers to meet bacteriological standards required overseas.

The programme was enlarged and is proceeding to include determinations on the incidence of *Staphylococci* in cheese imported from other countries.

Butter Quality Survey.—The biological quality of New South Wales butter was surveyed. A total of 644 butters, representing a weekly sample from all producing factories, was analysed for the following: total, yeast and mould, coliform, casein digesters and staphylococcal counts. Of these samples, 31.5 per cent were unsatisfactory on one or more counts.

The standards used for biological contamination have been published, and the results from this year's survey have shown marked quality improvement. Factory managements and field officers have been given the results and have used them as a basis for modifications or improvements in existing manufacturing techniques.

Extension Services in Dairy Products Bacteriology.—Addresses were delivered to professional, technical and farmer organisations on several occasions. The demand for technical information on biological control of dairy produce manufacture continued to increase and the services of the professional officers were provided for such instruction whenever possible.

Antibiotics in Dairy Produce.—Determination of residual levels of penicillin in milk supplies has been a feature of the past year's activities. This research has been a continuation of the studies conducted in 1957-58. Techniques for antibiotic detection have been studied with a view to recommending a method for general factory use. Field officers have been given instruction in the performance of a test dependent on bacterial inhibition by the antibiotic and introduction of the test to country factories is imminent.

Use of antibiotic contaminated milk by processing into butter and powdered and condensed milks is currently under investigation.

Blue-vein Cheese Research, Supported by Industry.—In conjunction with the Australian Dairy Produce Board, research into the manufacture of blue-vein type cheese has been initiated. The programme aim is to devise manufacturing methods for this type of cheese when HTST pasteurised milk is used.

Soil Bacteriology

Distribution of Legume Inoculants.—Preparation of agar *Rhizobium* cultures continued; for Experiment Farms, district agronomists, Branch experiments, and the Soil Conservation Service. A total of 406 cultures was despatched.

The collection of strains of the root-nodule bacteria was maintained. Eleven new strains were added.

Competition between Root Nodule Bacteria.—A project has been started to investigate factors influencing the ability of one strain or species to compete with another when these are grown together. Preliminary results have shown that the strains of clover root nodule bacteria so far tested dominate strains of lucerne bacteria growing in the same tube.

Testing Commercial Legume Inoculants.—In 1961, 118 commercial peat and freeze-dried legume inoculants were purchased in sixteen country towns and laboratory tested for quality. The high standard shown in the results for 1960-61 have been maintained in this, the fourth survey.

No unsatisfactory culture was detected and no report of suspected field failure was received.

A fifth survey has commenced. Preliminary results indicate that quality is again very good.

Field Testing of Strains of Rhizobia.—Field testing of commercial and promising strains of *Rhizobia* for agriculturally important legumes is carried out annually by Biology Branch. The University of Sydney conducts trials with the same strains. So, results from several sources are available. Information from these trials is used as the basis for the recommendation of strains for use in commercial legume inoculants.

The 1961 trials, conducted at Grafton and Cowra, were referred to in last year's report. Little useful information came from them, because of interference by effective native rhizobia.

Field trials for this year have been sown at Quaker's Hill. The results will be reported later.

Rapid Testing of Vetch Inoculants.—A project to devise more rapid methods for quality control of inoculants for large seeded legumes has been in progress for some time. New methods have been evolved for cultures for vetch (*Vicia sativa*), lupin, and cowpea (*Vigna sinensis*).

Statistically designed experiments to determine the validity and accuracy of the new assay for vetch cultures are nearing completion. Similar work on the rapid method for cowpea cultures is partly completed. The results to hand indicate that the new methods will be entirely satisfactory

In view of the promising preliminary results, the rapid method has continued to be used for vetch cultures in surveys of the quality of inoculants at the retail level.

Isolation of New Cowpea Strain.—About 30 isolates from widely different sources were made to find a strain of *Rhizobium* in the cowpea group, capable of fast growth on artificial media. However, all strains were relatively slow growing.

This work revealed an extensive distribution, in New South Wales, of native rhizobia effective on cowpea.

Pre-inoculation of Legume Seed.—This year, there has been a marked interest amongst research workers, commercial firms, and farmers in processes that would enable legume seed to be inoculated prior to distribution and up to six months before sowing. A successful pre-inoculation technique would represent a major agricultural advance. In this laboratory samples of pre-inoculated seed offered for sale are being examined for presence of rhizobia after various periods of storage.

An inhibitor active against rhizobia in vetch seed has been observed for the first time. The occurrence of these inhibitors in legume seeds has been reported only recently and their effect on survival of seed inoculum under practical conditions is not clear.

Diseases of Bees

Only nine specimens were received for diagnosis of diseases of bees. The marked decrease compared to 1960-61 (188 specimens) was due to the great number of 1960-61 examinations made in connection with importation of queen bees.

Of six samples of adult bees submitted, two were positive for *Nosema apis* (*Nosema disease*).

Three specimens of brood comb were examined; in two of these, field diagnosis of American Brood disease was confirmed by presence of *Bacillus larvae*. A comb affected with Sac Brood was received. An attempt to transmit this condition to healthy bees by means of an aqueous filtrate was unsuccessful.

No cases of Victorian Brood disease were encountered. Thus, no progress was made towards clarification of the difference between this disease and European Brood disease.

Industrial Bacteriology

Lectures at Hawkesbury Agricultural College.—Following the death of the Lecturer in Microbiology at Hawkesbury College, two bacteriologists from Biology Branch have spent three days per week delivering lectures and conducting practical classes in both dairy and food microbiology.

Industrial Bacteriology.—The work has been largely advisory. The field was broad. It ranged through fermentation problems in cement additives, bad odours in paints, and assay of pantothenic acid.

Entomology Branch

Field Crop and Pasture Pests

Australian Plague Locust (Chortoicetes terminifera) Incidence.—The Patrol Officer's first reports of general locust activity, in August and September, 1961, indicated locust densities of 1-2 per square yard (second and third instar) with some hopper bands, in an area enclosed by the towns of Trangie, Warren, Quambone, Coonamble and Gilgandra. Scattered and loose adults were superimposed, either from overwintering nymphs or from very early hatchings in July. This was the main region of spring activity. September and October were very dry and numbers seemed to decrease except in the more favourable eastern section. Here, large hopper bands were observed in October, in the Curban-Hillside-Biddon area (Coonabarabran district).

After local thunderstorms in late October there were serious infestations over much of the region described. A considerable outbreak then seemed possible, involving the districts of Coonamble, Coonabarabran and Dubbo. Like other recent outbreaks in this area a large percentage of the hoppers were loose or scattered although densities were quite high. However, by early November, many had become adult and formed flying swarms. These were in particular along the Castlereagh River and further east in the Coonabarabran district. The swarms were controlled by an aircraft spray campaign in December.

Between September and December, 1961, some 18,200 gallons of 7 per cent BHC was used (including 7,248 gallons for aerial spraying).

In early January, 1962, there were heavy hatchings and large hopper bands of the second locust generation in Dubbo and Coonamble districts. Loose flying swarms had appeared during November and December, after rain, near Trangie, Wellington and Geurie. These apparently arose from scattered local hopper populations. However, by February the expected formation of large flying swarms had not occurred. Extensive areas of scattered locusts remained in most places. This scattering tendency continued during March. By this time the locusts had ceased to be a significant factor.

Elsewhere, locust activity was widespread during spring, 1961, but not on a scale approaching that in the central west. Moderate infestations occurred at Narrabri and Tamworth, and scattered hatchings at Moree, Warialda and Pilliga. A few large swarms were in the Bourke district on a flood plain near Yantabulla in October.

In March, 1962, locust activity occurred in the more southern and western portions of New South Wales. Condobolin, Wagga and Narrandera reported scattered adults and loose swarms moving south-east in tentative, drifting flights. Further south, scattered infestations occurred in Urana, Jerilderie, Deniliquin, Hay and Balranald, while further west, in Hillston, Broken Hill, Wilcannia and Milparinka, low density flying swarms were reported. These all appeared to be of local origin.

A heavy infestation in Victoria at the same time was of special interest. Vegetable areas of Wemen and Nangiloc were damaged. Large swarms were also reported flying north from Victoria into the Moulamein district. These heavily damaged pasture along the Murray River.

Increased P.P. Board Activity in Locust Control.—A recent trend has been for more active participation in locust control campaigns by the Pastures Protection Boards. This has been encouraged by the Department.

A new attitude towards control was brought about in the Dubbo district by provision of a number of Micron sprayers to the Board. Attempts were made to free large acreages from sub-swarming hopper populations. The machines were either used directly by Board employees or by landholders under some supervision.

A further departure from previous years was in handing over direction of the aircraft spraying campaign to experienced Board officers. After locust populations had been assessed and the decision taken that aircraft were required, the whole campaign, including organisation and actual direction of spraying, was handled as a co-operative effort by the Rangers of three Boards—Dubbo, Coonamble and Coonabarabran. It was an outstanding success. Many large swarms were eliminated and migration was minimised.

Further similar moves were made at a Dubbo meeting in January, 1962. Representatives of the Forbes, Condobolin, Dubbo, Canonba, Coonabarabran and Coonamble Boards met to discuss locust developments. They decided to form the Boards concerned into a locust region under direction of a central committee and to appoint a regional locust officer. He would provide necessary liaison and accurate knowledge of locust population fluctuations. If this move towards a self-contained region comes to fruition, it will be a major advance in locust control in N.S.W.

Correlation of Locust Plague Incidence and Weather Information.—Study of a detailed history of outbreaks between 1934 and 1959 continued. As part of it, fluctuations in locust numbers in relation to rainfall were studied and final conclusions reached.

By a multiple regression technique, a method to predict future spring outbreaks has been devised in the main outbreak areas. This prediction equation proved sufficiently accurate for practical purposes in the last season. The work has been incorporated in a paper accepted for publication in the *Australian Journal of Agricultural Research* in 1962.

Assessment of Locust Phase Status.—Apart from collation of field observations and reports from the locust information service, collections of locust specimens were continued. This was for study of possible relationships between phase status (as determined by measurements of individual locusts) and swarm behaviour. For such a study it is a big advantage to know the past history of the swarms and of their parents. It involves detailed and continuous observations in the field. This was possible for two series at Trangie and Coonamble.

Wingless Grasshoper (Phaulacridium vittatum).—Field investigations in the Cooma district continued from the previous season, mainly on a property between Cooma and Adaminaby. Distribution, movement and importance of *Phaulacridium* as a pasture pest were studied. The findings have been placed on record elsewhere.

It would seem that only during the normally dry summer months does *Phaulacridium* become a pest of much significance. In a good season there is ample feed available for both stock and grasshoppers.

Clover Root Weevil (Amnemus quadrituberculatus and *A. superciliaris) Studies.*—Heavy larval infestations were in clover pastures in the Richmond-Tweed district in winter, 1961 but the weather favoured plant growth and in spring there was little evidence of clover damage. In summer, heavy hatchings of adult weevils occurred in most areas and early (January-February) larval infestations were recorded in some pastures in the prolonged warm wet weather.

Severe damage by larvae in a late sowing of the summer legumes *Desmodium uncinatum* and *D. intortum* at Cudgera, in May, suggested that these pasture species should be sown early before larvae are present in the soil.

The life-cycle of a second species of *Amnemus*, viz., *A. superciliaris* (Pascoe), found in clover pastures in the Casino-Kyogle area in 1960, and of an internal *Braconid* parasite of *superciliaris* taken from weevils collected at Grafton in 1961, were studied in the laboratory.

Field control studies concentrated on effect of root weevil control on clover yield. The experiments failed in some respects, but the 1960 dieldrin results were confirmed and definite control recommendations have been issued. Statistics from Lismore, Kyogle and Murwillumbah agronomists indicate that about 1,500 acres of clover pastures were treated for *Amnemus* control in 1962.

A seeming new species of *Amnemus* was heavily infesting clover pastures in Casino-Kyogle district. It has now been identified as *Amnemus superciliaris* (Pascoe), originally described in 1870 from material collected in Queensland. Early records of the species are from Windsor, Dalmorton and Glen Innes in N.S.W.; and Brisbane, Rockhampton, Mackay, Mt. Dryander and Dawson River in Queensland (A. M. Lea, 1906). Recently the species has been collected at Casino, Fairy Hill, Rock Valley, Kyogle and Grafton in N.S.W., and Sanford and Beerwah in Queensland.

Beating the Pests by Mobile-Tower Spraying

To get an adequate spray cover on big trees was one of the troubles in orchard pest control. Despite conscientious efforts, the costs of spray material and labour were not necessarily rewarded by control of the pests. A platform tower on the mobile spray unit has answered the problem, and is another contributor to orchard economy.

A. superciliaris appears to be only in the western parts of the coastal belt in N.S.W. and generally occurs in association with *A. quadrituberculatus*. The two are similar morphologically, and in habits and host range; and parallel in life cycle. For field control, the two may be regarded as a single pest.

Wasp Parasite (*Microctonus* sp.) *of Amnemus superciliaris.*—The first naturally occurring internal parasite of *Amnemus* was recorded in January, 1962. Maggot-like larvae were observed on the bottoms of cages containing *A. superciliaris* and, finally, small wasps emerged from these larvae. The small wasps (2 mm.) were *Microctonus* sp. m. family Braconidae. Specimens were sent to Parrott at the British Museum. He proposes to describe and name the species in a paper on the Australian *Braconidae*.

A culture of the parasitic wasp is being maintained at Wollongbar for life history studies. The adult is short-lived (2-3 days) and apparently does not feed. Eggs appear to be injected into the weevil in the region of the intersegmental membranes of the legs and abdomen. Each female wasp oviposits in only one host weevil and 18-24 eggs are laid (judged by larval emergences from host). The larval stage, 16-27 days, is passed completely within the host. Larvae emerge from the anus of the host as fully fed pre-pupal larvae. As the larval stage progresses, the host weevil becomes increasingly sluggish but does not die until the pre-pupal parasite larvae emerge. The larvae drop to the ground and burrow into the soil. There they spin a cocoon and pupate. The pupal stage is fourteen days.

Microctonus sp. appears to be specific to *A. superciliaris*. The initial collection of weevils from Grafton comprised 515 *A. quadrituberculatus* and 520 *A. superciliaris*. Only the latter were parasitised. Laboratory attempts to induce parasitism in *A. quadrituberculatus* were unsuccessful.

The present known distribution of the parasite is Grafton and Fairy Hill.

Black Soil Scarab (*Othnonius batesii*) *Studies.*—Sampling of sixteen separate populations in the Graman area during the period March, 1959, to November, 1961, showed that fourteen populations have increased, one has remained stationary and one has decreased.

Damage in infested native pastures at Wallangra, Gragin, Rob Roy and Graman is increasing. Many people are now concerned about drop in production and carrying capacity on native pasture. Damage to wheat crops in the Graman area was fairly widespread. Some crops were badly damaged. Some *Sorghum almum* stands in the Graman area were badly damaged in the spring-summer period.

The 1961-62 flight season was the lightest yet recorded. It lasted from 28th November to 17th December, 1961, and three flights occurred. One gravid female was collected on the ground surface on 17th January, 1962. The overall average number of eggs per female reproductive system this season was as follows: Phase I: 26.35 (55 beetles, 1,449 eggs); Phase II: 16.95 (40 beetles, 678 eggs).

Eleven more control trials were set up. One ecological-behaviour trial was also established.

Among other things, the trials have shown that:—DDT is still exerting a controlling influence on populations. Parathion at 0.5 lb. of active ingredient per acre has promise. An 80-acre area at Gragin sown to wheat, plus 20 lb. of 2½ per cent parathion attapulgite granules per acre, showed that this rate of parathion is a worthwhile treatment against *O. batesii*. In the thus treated area there were (i) better germination and seedling growth (the seedlings at least twice the size of the non-treated); (ii) better secondary root development (at least five times that of the non-treated; (iii) no dead plants (while dead and damaged plants were in the non-treated area).

In an establishment trial, with *Phalaris tuberosa* as the indicator plant and where an increase or decrease in the stand is indirectly a measure of grub activity, this season's ranked results showed that in comparison with the 1960 estimations: Muscatox was still the most effective material, parathion a close second, then DDT, then diazinon. Most of the other chlorinated hydrocarbons, including aldrin, dieldrin, BHC and heptachlor, were less effective. Plots treated with aldrin, dipterex or Thiodan in some cases were worse than the untreated area.

In another trial, Thimet, Bayer 5082a, Lebaycid, Gusathion, Sevin and Trithion showed promise, especially the first named two. Telodrin showed no promise.

Results of this trial are in general agreement with those obtained in previous years with other materials. For example, Telodrin, an aldrin-dieldrin related compound, has given much the same unsatisfactory results as the latter materials. The organic phosphate materials, with the possible exception of low rates of Trithion and malathion, are well to the fore. However, some of the insecticides had a disastrous effect upon germination. Whether this is due to the insecticide or to other chemicals added during formulation is not known. Malathion, Sevin and Bayer 5082a, all at 8 lb. a.i. per acre, were especially severe on germination.

In a trial initiated in the 1959 winter the effect of period of cropping on population density has been studied. Continuous cropping seems to reduce populations of *O. batesii*, but it is too early to draw conclusions.

In a trial designed to study the effect of cultivation on *Othnonius* populations, two areas of 1,400 sq. yd. were selected; half of each was ploughed on 30th December, 1960, and 14th February, 1961. On 20th-21st March, 1961, each trial area was sampled. Twenty 1 sq. ft. samples were taken from both the ploughed and unploughed areas. There was not significant difference between the two treatments.

Pruinose Scarab and Related Scarabs (*Sericesthis pruinosa*).—Trials have been initiated to test the effect of soil pH. on *S. pruinosa and Rhopaea* sp. populations. Four rates of lime application were applied to a paspalum-white clover pasture. No visual difference in results was observed as between treatments.

Another trial was in an area which had been badly damaged by *Rhopaea* larvae in autumn, 1961. No difference in pasture establishment of *Phalaris tuberosa*, ladino and red clover could be seen between plots where parathion granules had been incorporated in addition to superphosphate and plots which received only superphosphate, but both were in strong contrast to the untreated area. However, renovation and resowing of the grub-damaged areas, whilst perhaps not controlling the grubs, returned the area to productivity in the shortest time possible.

Underground Grass Grub (*Oncopera* sp.).—Damage by *Oncopera* sp. was in nearly all improved pastures inspected in the Ebor-Dorrigo area during late winter and spring of 1961. Pastures heavily grazed from November, 1960, to February, 1961, were the only exceptions.

Flights of *Oncopera* adults were reported as "the heaviest and most prolonged ever seen". They occurred from January to March, 1961.

An insecticide control trial was laid down on 30th August, 1961, at Ebor. Several insecticides, including parathion, Thiodan and Muscatox were applied, as granule or emulsion spray, at the rate of 12 oz. active ingredient per acre. Parathion granules gave the best control, followed by DDT and could be an alternative if use of DDT on pastures is stopped.

Adult specimens from Comboyne were identified at the South Australian Museum as *O. alboguttata*, a species previously known only from a record at Killara.

Brown Wheat Mite (*Petrobia latens*) *Project.*—No critical work was undertaken on it this year. However, a heavy infestation of mites developed over the *Penthaleus major* trial area, especially on the blocks which had been treated with 4 oz. a.i. DDT per acre. Two DDT treatment blocks were re-sprayed with a mixture containing 4 oz. a.i. meta-iso-systox, 2 oz. a.i. diazinon per acre. This mixture had no effect on *P. latens*. Also, cold, wet weather had little effect on established populations.

Pea Mite (*Penthaleus major*) *and Wheat Yield.*—Effect of *P. major* populations on wheat yield was studied in a Graman trial. A randomized block design was used. Plot size was 60 x 10 yards. DDT at 4 oz. a.i. per acre was to be compared with no treatment. However, due both to a dry spring and heavy infestation by *Petrobia latens*, the trial had to be abandoned. The trial did show that DDT at 4 oz. a.i. per acre gives good control of *P. major*.

Budworm (*Heliothis punctigera*); *Linseed Studies.*—Three control trials were carried out on linseed. Infestation did not become serious, but larval counts showed that DDT is still the best available insecticide for this purpose. Thiodan and Bayer 5024 showed promise as alternatives.

Pasture Scarab (*Aphodium howitti*).—In July, 1961, at Lidster, near Orange, the effect of ripping a Sub-clover dominant pasture, in summer, on subsequent infestation by pasture scarab was examined. Previous observations had indicated it might be worthwhile.

The July observations in the plots ripped in January, 1961, indicated that surface activity is still being depressed, as compared with no ripping. Observations will be continued later into this winter.

White Fringed Weevil (*Pantomorus leucoloma*).—Further observations were made in September, 1961, in an experiment at Cowra. In this, dieldrin 2 lb. a.i. per acre had been sprayed on to an infested stand of lucerne; and heptachlor granules, 2 lb. a.i. per acre, mixed with superphosphate had been applied by means of a combine. The area was lightly scarified right after each treatment. The treatments were applied in early February, 1960.

Grub counts later in 1960 had shown these two treatments to have been ineffective and similar counts in 1961 confirmed this. However, observations on an adjoining property in October indicated that heptachlor granules, 2 lb. a.i. per acre, applied during December, 1961, had greatly reduced infestation compared with a nearby untreated area. This indicated that control could be obtained provided the treatment is done by December.

Further grub counts were also made at Cowra in September, 1961, in another experiment. In this, pre-sowing treatments of aldrin and dieldrin, 1 lb. and 2 lb. a.i. per acre, are being tested. One series was applied in February, 1959, and a second series in August, 1959. These counts showed the infestation level to be still very low in two untreated check plots, whilst counts in all treated plots, except where aldrin 1 lb. per acre was applied in August, 1959, were very much lower than in the untreated. All treatments, with the one exception, have given control. Aldrin 2 lb. per acre seemed more effective than aldrin at 1 lb.

Observations elsewhere on this property in October, 1961, indicated more strikingly than did the above experiment plots that pre-sowing treatment gives control. Land treated with dieldrin 1½ lb. a.i. per acre in August, 1959, prior to sowing, was now virtually free of the pest. An adjacent untreated paddock was heavily infested.

Work at this property is continuing; to ascertain how long a period of protection can be given by soil treatments pre-sowing.

Black Beetle (*Heteronychus sanctae-helenae*).—There was scarcely any activity of this pest and, following the abundant spring and early summer rainfall the black beetle should not be of any consequence in spring, 1962.

Potato Moth (*Gnorimoschema operculella*).—A replicated plot experiment at Orange compared several insecticides with DDT, for potato moth control in potato foliage. The treatments tested were: DDT 0.1 per cent, Ethyl-Gusathion 0.0375 per cent, Sevin 0.1 per cent, Telodrin 0.031 per cent, and endrin 0.031 per cent.

Infestation rapidly increased in untreated plots late in March. Observations were limited to a 24-day period, because of heavy early blight infection in April.

DDT, Telodrin and Gusathion remained fully effective. There was trace re-infestation in endrin plots at the end of 24 days. Re-infestation was heavy in the Sevin plots in 21 days, and this treatment was definitely inferior. Telodrin, Gusathion, and no doubt endrin, may be regarded as satisfactory alternatives for DDT. Later, larger-scale testing of them would be desirable.

Observations in the experiment indicated that only the endrin treatment gave any control of potato aphids *Macrosiphum euphorbiae and Myzus persicae,* and it was not sufficient. DDT, Sevin and Telodrin permitted heavy build-up of these pests.

Wheat Root Grub (*Anodontonyx noxius*).—Damage was reported from districts as widely separated as Deniliquin, Wagga, Cootamundra, Parkes and Tamworth, but the injury usually was not extensive. In a Tamworth crop about 25 per cent of wheat plants in a 63-acre crop had been damaged. Heptachlor granules at the rate of 4 oz. active ingredient per acre had not prevented injury.

Red-Legged Earth Mite (*Halotydeus destructor*).—Due to later arrival of rains in the south, little hatching had taken place by the end of May, and no damage had been reported up till this time.

Good rains fell in southern districts late in May, and by the second week in June mites had appeared in Wagga district. In contrast, by the end of June, 1961, earth mite treatments had been many and practically completed.

Because of possible future restrictions on use of DDT on pastures, a trial with several different organic phosphate insecticides against red-legged earth mite had been established at the Agricultural Research Institute, Wagga.

Each of the eleven materials: Rogor, Sayfos, Metaisosystox, Gusathion, A. 6344 (I.C.I.), Zectran, Sevin, SD. 4294 (Shell), DDT, Eradex and Ekatin was sprayed on 72 ft. x 72 ft. plots at 2 oz. active ingredient per acre. Observed at 48 hours after treatment, each of Sayfos, A. 6344, Zectran, Sevin and Eradex failed to give mortality. The others all gave high initial mortality. The plots will be observed again in three weeks' time and, given favourable conditions, further treatments at lower dosages will be compared.

Sorghum Midge (*Contarinia sorghicola*).—In Tamworth and Gunnedah districts this was a bad sorghum midge year. In Coonabarabran, Inverell and Moree districts the pest was less severe, due to drier conditions.

In the Tamworth and Gunnedah districts many growers engaged aircraft operators to spray their crops. A mixture of DDT and malathion was used. Opinions varied as to the benefits. Some growers had their crops sprayed well after they had become infested and the damage had already been done. Timing of the spray in relation to flowering was seen to be of utmost importance.

Only crops promising to yield well would be worth spraying, and then only after assessing the midge population at the time the first heads were extruded. If midges reappeared on later flowering heads (and they can reappear within a few days of spraying) the value of that part of the crop still to come into flower would be weighed against the cost of one more extra spraying.

Because of increased fodder acreages of *Sorghum almum,* an alternative host plant for midges, sometimes flowering before the main grain sorghum crop, sorghum midge damage to grain crops will be an increasingly serious problem.

Cotton Insects (*Heliothis sp. and Earias huegeli*).—In Yanco trials this year, DDT 1 lb. per acre plus endrin 4 oz. per acre were used as the standard materials to establish the optimum interval between spray applications; to control common bollworms (*Heliothis* sp.) and rough bollworms (*Earias huegeli*).

The optimum time appears to lie between two- and three-weekly applications, from flowering (early January) until harvest. The choice here is between eight and six applications. Monthly intervals (four applications) gave some control of insects, and increased yields, but were far less satisfactory than the two- and three-weekly applications. Thiodan 1 lb. per acre at fortnightly intervals gave as good control as DDT and endrin.

To establish whether spraying of early bolls can be avoided, as it is in Queensland, a fruit form removal trial was conducted. From this it became obvious that fruit form removals for as late as four or six weeks after start of flowering in this region will lead to uneconomic yields, in fact almost none, because of shortness of growing season.

In this same trial carbaryl (Sevin) again proved very promising for cotton insect pest control.

Other Cotton Pests.—Reports of black beetle damage to cotton seedlings at Forbes were investigated. The beetle was found to be the native *Metanastes vulgivagus.* It caused typical "black beetle damage", but the total seedlings killed was an insignificant percentage of the total stand. No control measure was necessary.

In glasshouse trials, seed treatments with various insecticides were tested. Toxicity, to aphids and to red spider, conferred on seedlings by treatment of seed with different systemics, was studied. Aphids and red spiders were caged and required to feed on a leaf of the seedling.

All Thimet treatments gave a complete kill after two days of opportunity to feed. These included emulsion dips at 0.05 per cent, 0.10 per cent and 0.20 per cent a.i., and also three minutes tumbling in a formulation of Thimet on activated carbon. Other treatments gave variable results.

Of a series treated and planted on 23rd March, 1962, and infested with *Myzus persicae* on 12th April, 1962, 8th May, 1962 and 29th May, 1962, the treatments comprising Thimet or Disyston on activated carbon killed the aphids within two days of transfer to the plants, up to 31st May, 1962, 69 days after treatment.

Where seed had been dipped on 17th April, 1962, for 30 minutes in Rogor emulsion and Sayfos wettable powder, aphids were killed only up to 14 days after treatment. With Thimet on activated carbon or Disyston on activated carbon, both tumbled with the seed (and also soil treatments with each of these two materials), aphids were killed right up to the observation on 27th June, 1962, 69 days after sowing.

Thimet granules applied to the soil at each of the rates 4 lb. and 8 lb. a.i. per acre conferred seedling toxicity to aphids for only 26 days and 37 days respectively.

Aphid species used included *Aphis gossypii, Myzus persicae* and *Macrosiphum euphorbiae.*

Bloodworms in Rice (*Chironomus* sp.); *Life History Studies.*—Life history studies at Yanco showed that at water temperatures between 25° and 28.5°C. eggs of *Chironomus* sp. (*C. tepperi?*) hatch within 36 hours of being laid.

The eggs hang on a spiral matrix about ½ in. x 0.15 in. Most of the spirals hang from the surface of the water. Variation in egg size is very small and averages 0.355 x 0.1 mm. As few as 120 but as many as 518 eggs have been counted in the one egg spiral. The number is partly determined by breakages in the spiral.

Not all larvae colour up with haemoglobin immediately, but 50 per cent do so within 48 hours. Also, within the same time the larvae formed tubes (with 1 mm. diameter openings) which went perpendicularly into the soil. Tubes are formed also around the bodies of some larvae, from mud particles. These larvae may be found freely on the surface, but are not so numerous as those which tunnel in the mud bottom. Larger larvae occasionally used pieces of straws as tubes for shelter and feeding.

Larval feeding appears to be of two kinds: feeding on mud and plant tissue within reach, and surface feeding. These will be examined more closely.

Within a week of hatching some larvae were as long as 1 cm., but most were between 4 and 7 mm. Adult emergence occurred within 24 hours of pupae appearing, which takes place 31 days after the eggs hatch. Adults appeared to be short-lived. Male and female adults were present in equal proportions. Adult activity was mainly in September, early mid-November and early to mid-December. Adults when present were numerous and in swarms, a nuisance to people to walk through as they flew up from thistles and other erect parts of plants. Adults occurred away from water but not as swarms. Lights drew them.

Larvae were typically found in shallow water with rotting vegetation, especially in sod-seeded rice.

Farmers satisfactorily controlled larvae with dieldrin and DDT, but larvae reappeared within 4 to 6 weeks.

Lucerne Seed Wasp (*Bruchophagus gibbus*).—Following the promising 1960-61 results from fenthion (Lebaycid), it was further tested this season.

Sprays of 0.125 per cent fenthion were applied at three- and four-weekly intervals during flowering and seed set.

Some 53 per cent of the seed harvested was free of lucerne seed wasp damage while in the untreated only 35 per cent was sound. Control of the wasp was reflected by a 50 per cent increase in seed yields.

Carrot Seed Insects (*Nysius vinitor, Cavariella aegopodii, etc.*).—In a carrot seed increase trial at Yanco, flowering commenced in October and various small bugs were present in the blooms. They showed a preference for attacking the "green spine" stage, shortly after seed set. Malathion and DDT were used to control them.

During the second flowering, in late November, swarms of *Nysius vinitor* moved into the carrot crop. Malathion and DDT gave excellent control. Yield results showed a marked increase in the treated plots. The seed has been submitted for germination tests.

Fruit Pests

Red Spider (*Tetranychus telarius*).—Red spider remains the most troublesome insect pest problem on fruit trees at Orange. Satisfactory acaricides are in use, but problems of spray application to secure adequate penetration of interiors of trees are unsolved.

An investigation in April at Nashdale, near Orange, strongly pointed to development of resistance to Kelthane. Material is now at the Rydalmere laboratories to test for such resistance.

In October at Orange, observations were made on severe infestations developed when the trees were in blossom. Severe damage was caused to unfolding apple leaves, particularly those associated with the blossom clusters. Blossoms in the lower parts of the trees were also sometimes damaged. The Delicious variety was particularly heavily infested.

There was no trouble where good control had been obtained the previous season and where overwintering populations were light.

Where there was any attractive ground cover, spiders did not infest the tree but went straight on to this ground cover. The herbage was mainly sub clover. Blackberry was also very attractive. Grasses were not attractive. On attractive ground cover, egg-laying was much more profuse than on apple foliage.

A good deal of spraying with Kelthane was done, concentrating on the lower half of the trees, with excellent results.

From about the third week in October, as trees foliated rapidly and attractive ground cover developed, infestation became insignificant. The period of acute damage in the spring lasts perhaps two weeks.

In the M.I.A. the pest was not as severe as in previous years. Growers experience variable results with ethyl and methyl azinphos (Gusathion). They had much more satisfactory results with Kelthan, which proved so variable last year. Growers are now aware of the need of at least two applications with even as effective a material as Kelthane. Tetradifon (Tedion) has continued to give excellent results.

Prune Scale (*Eulecanium pruinosum*).—An experiment at Young is examining the effect of malathion-white oil and Trithion-white oil mixtures in control of this pest on prunes during summer.

The treatments applied in December, 1961, when all eggs had hatched, many scales had settled on the undersides of leaves and great numbers of crawlers were making their way to summer feeding sites, included (*a*) malathion 0.1 per cent and white oil 1/100, and (*b*) Trithion 0.045 per cent and white oil 1/100.

Examined in January and again in March, when counts of live scales on leaves and twigs were made, the malathion-oil was more effective than Trithion-oil and gave effective control. Unsprayed trees showed a heavy deposit of sooty mould on leaves and twigs due to the presence of numerous scales during the summer. Sprayed trees were free of this deposit. The trees will be finally examined in the 1962 winter.

Wooly Aphid (*Eriosoma lanigerum*).—A further experiment at Orange tested Sayfos at 0.01 per cent, 0.015 per cent and 0.02 per cent active ingredient, applied in early December, and compared it with the standard recommendation of lindane 0.1 per cent at green tip. The trees used carry considerable root infestation and have regularly become infested following green tip spraying. They were the same trees as in the previous season's experiment.

All three Sayfos treatments were superior to the lindane treatment, and in the type of trees used in this experiment are definitely preferable. Sayfos at 0.015 per cent and 0.02 per cent were much better than 0.01 per cent; and 0.02 per cent was superior to 0.015 per cent, but not greatly. Each of the two concentrations was excellent. However, until tested under a wider range of conditions, no general recommendation will be made.

An experiment was commenced in early March to test airblast and hand applications of Phosdrin 4, 6, 8 and 10 oz. per 100 gallons, to control the pest in autumn. Each gave an apparently complete kill, but about a fortnight after treatment there was virtually complete mortality of the pest in unsprayed check trees, due to some unidentified natural agency.

Bud Mite of O'Hanez Grapes (*Eriophyes vitis*).—The trial laid down in the spring of 1960 to establish the most effective time of treatment was assessed in the 1961 spring. Pending statistical analysis, the results suggest a single application two weeks after flowering, when the bud primordia are being laid down.

Codling Moth (*Cydia pomonella*).—Growers throughout the State still obtain excellent control with either azinphos (Gusathion) or carbaryl (Sevin). There has been no report of failure.

Black Peach Aphid (*Brachycaudus prunicola*).—No experimental work was done this season. Excellent grower control was obtained with the systemic insecticides demeton methyl (Metasystox), mevinphos (Phosdrin), thiometon (Ekatin) or menazon (Sayfos).

Green Peach Aphid (*Myzus persicae*).—In the spring a trial on a well-established infestation of green peach aphids on actively growing trees at Yanco showed excellent control with 0.01 per cent menazon (Sayfos) and 0.03 per cent fluoracetomide. There were no ill-effects on a thriving population of parasitic wasps and predatory ladybirds and lacewings in either case. On fluoracetamide trees, thrips appeared not to be affected.

Zectran 0.0125 per cent killed 90 per cent of the population without injury to the trees. However, whilst it very efficiently killed the peach aphid it did the same to the predator population.

Azinphos (Gusathion) at 0.05 per cent did not effectively control the aphids.

San Jose Scale (*Quadraspidiotus perniciosus*).—In the autumn, in a screening trial against a heavy infestation of San Jose scale on prunes, a single application of 0.1 per cent carbaryl (Sevin) plus 1 in 100 white oil showed outstanding promise.

Trithion 0.03 per cent plus oil 1 in 100, malathion 0.1 per cent plus oil, and ethion 0.05 per cent plus oil gave very satisfactory results; followed by 0.05 per cent azinphos (Gusathion) plus oil. The other materials tested, namely fenthion (Lebaycid) plus oil, and dimethoate (Rogor) plus oil, gave poor results. The results were based on counts made five to seven weeks after spraying.

In a State-wide survey of San Jose scale occurrence, identifications by a Tasmanian Department of Agriculture officer recorded as hosts, other than cultivated stone and pome fruit trees, only Cercidiphyllum and Osage orange.

Dried Fruit Beetles (*Carpophilus* spp.); *Life History Studies.*—Laboratory investigations into the life history of field-collected *Carpophilus* sp. showed an average life history at a constant 25°C. of 29.5 days from egg to adult. The adult emergence on most occasions was 3.7 times the original number. Survival under favourable laboratory conditions was not in excess of two months (fluctuating temperatures).

Field trappings in a peach orchard were conducted throughout the year with interesting results, now on record. In the winter, adults were readily found sheltering in cracks and under bark on the tree from which they emerged in the spring. Winter survival also occurred in the soil. There, 57 per cent were adults, 30 per cent were larvae and 13 per cent pupae.

With a plant pathologist, various field investigations were made; including weekly spraying of a peach tree (a different one each day) and collections of the fallen insects. The aim was to determine the real activity of the beetle on the trees. Examination of the data is proceeding.

In early winter, adult beetles carrying brown rot spores which do not infect citrus were found well within a Navel orange block. They were presumed to have migrated between 50 and 100 yards, from peach trees. About 5 per cent of the beetles found were carrying the stone fruit brown rot spores.

Some primary damage to peaches was noted in January in ripening varieties (Youngs), especially those with a marked suture line.

In the laboratory a number of insecticides were tested against adult beetles under a temperature range of 68° to 80°F. Under the conditions of the experiment, recorded elsewhere, 0.05 per cent azinphos (both methyl and ethyl) gave 71 per cent control, and 0.1 per cent malathion gave 57 per cent control, followed by 0.2 per cent DDT and 0.05 per cent dieldrin. Each of the two latter gave 50 per cent control. The following materials tested were not satisfactory: DDT 0.1 per cent, malathion 0.05 per cent, ethion 0.05 per cent, Thiodan 0.05 per cent, parathion 0.025 per cent, TDE 0.1 per cent, carbaryl 0.1 per cent.

In the field, two applications of malathion 0.1 per cent was very satisfactory.

In a soil treatment field trial, the soil surrounding blocks of trees 4 x 4 were treated with dieldrin 1 lb. per acre. Significant differences were not detected at harvest between the treated and untreated.

Oriental Fruit Moth (*Cydia molesta*); *Adult Activity Studies.*—Lure traps were again maintained at Yanco and Griffith as indicators of Oriental fruit moth adult activity. There was no marked emergence as in previous years at petal fall, but it did commence then, and continued steadily until the first week of November. Then adult numbers greatly increased—from five in the previous week to 232 and 155 per trap. From then on, moth activity continued at a high level for the season. The next peak abundances were in late December and late January. Unusually high numbers were taken in early February and again in early March.

The general level of adult activity was high and this year there was a much larger crop of fruit to provide host material for the larvae. Emergence in February and March brought forth larvae just in time to infest the Golden Queen peaches, but more especially the late maturing Pullars Cling, a major peach variety.

Examination of randomly selected peaches on several farms revealed infestations of peaches: as much as 12 per cent, but usually less than 5 per cent.

Growers have had good results with azinphos (Gusathion) and carbaryl (Sevin). Some reports of unsatisfactory control could be due to inadequate spraying.

Peach Silver Leaf Mite (*Vasates cornutus*).—Farm surveys showed no direct relationship between numbers of the silver leaf mites and peach bud shedding in 1961.

In the insecticide trials there was no significant response to either parathion or Phosdrin in the percentage of buds retained on the tree.

Fruit Fly (*Dacus* (*Strumeta*) *tryoni*) *Whole-Town Control Projects.*—A factorial experiment using two types of treatment was conducted in twelve relatively isolated towns in the north and central west of the State. This was in co-operation with the C.S.I.R.O. and Union Carbide Aust. Ltd. The basic aim has been to test the effect of a male-lure treatment, applied to a 50-yard grid to built-up town areas on its own and also in association with a conventional protein-malathion spray bait treatment.

The male-lure applications have been made in the six towns concerned at three-month intervals commencing in August, 1961. Sheep drenching guns were used to apply the dose to tree bark, fenceposts, etc. The solution contained 5 per cent of the poison DDVP and 2.5 per cent of each of para hydroxy benzyl acetone and para acetoxy benzyl acetone. At the first application, 10 ccs. of the alcoholic solution were used at each chosen grid site, but the dose was doubled in subsequent applications.

Parallel trials have been conducted in the Sydney region to test the longevity of male-lure treatments on different surfaces. These trials led to doubling the dosage rate. Certain barks, of absorbent type, have been particularly suitable for the deposit. Another trial showed a better catch of flies when both DDVP and premium grade malathion were mixed with the lure, than when either insecticide was used singly.

The protain-hydrolysate and malathion bait was applied at fortnightly intervals, from late October, 1961, in each of the six towns, over an area of about 4,000 acres. Drive-past technique was adopted, initially aiming to deposit 5 grams of each ingredient per acre. This was increased to 15 grams. It was deposited on leaves of suitable trees or shrubs at 20 foot intervals along all frontages. This 15 grams rate represents 15 dosage spots per acre in average sized town blocks with lanes. Cost of materials was about 15 pence per acre per application.

During the fruit-ripening season samples were taken from the nine treated and the three untreated towns. The samples were examined by the C.S.I.R.O. for infestation. Results for 1960-61 favour the double-treatment towns. They also indicate a possibility of cheaper control. The experiment is continuing.

Following the 1960-61 fruit fly male annihilation project at Richmond-Windsor, the male-annihilation treatments were maintained throughout 1961-62. Also, from the second week of December, 1961, protein-hydrolysate and malathion bait were applied fortnightly as drive-past spot splash treatments to the built-up area of Richmond, comprising about 300 acres.

The protein bait was applied to shrubs or trees at intervals of 25 to 40 feet along both sides of lanes and streets. The aim was ten deposits per acre. Jets of bait were directed to deliver about 4 fluid oz. of bait at each release. Liquid was fed to the nozzle at a pressure of 250 lb. per sq. inch. Eighty gallons of bait were used per application and contained 12 lb. of 25 malathion w.p. and 12 pints of 21 per cent protein hydrolysate. Cost of the material averaged five pence per acre per application.

The 348 male-lure stations were maintained in Richmond and environs as in the 1960-61 season, at grid intervals of 110 yards. They were rejuvenated in September, 1961, at a one-half gram dose (i.e., ½ gm. of the organic phosphate insecticide DDVP plus ¼ gram of each of the male attractants 1-p-hydroxyphenyl butan-3-one and 1-p-acetoxyphenyl butan-3-one) and again in December at a one gram dose per grid site.

The 48 catching lure stations on this same grid, but at 330 yard intervals, were also maintained in sticky condition by periodic application of an admixture of polybutenes. These traps were examined weekly, to check on the relative activity and abundance of maturing and mature male flies. In this way, in comparison with the 1960-61 counts, clear indication was obtained that the late-winter population of these flies

could be reduced by these lures exposed since the previous autumn. Otherwise, the lure counts indications were similar to those of the 1960-61 season.

Following strongly increased catch numbers of male flies in the late September-early October period, 1961, less male flies were caught until the end of December. This period was one of floods, with many days of rain. There was heavy fruit loss and a lot of disease in the peach crop at Richmond and Windsor.

Sampling of peaches for infestation rate comparisons between the two towns was done as in the 1960-61 season. In each of the five samplings, from 7th December, 1961, until 5th February, 1962, four ripening fruits were taken at random from each tree carrying maturing peaches in both towns.

Traps containing Willison's male lure and malathion have been maintained in south-western towns since April, 1960; 85 are in the M.I.A. and towns up to 50 and 70 miles away. Thus, in 1961-62, Queensland fruit fly activity was detected in Hillston (all the year round), Griffith and Yenda (October to May, except April), Leeton and district (December, February, April and May), Narrandera (May only), Coolamon (March) and Ardlethan (March). Larval fruit fly were found in Hay but no adult was trapped.

Non-retaining male-lure baits were distributed to all fruit farms in the M.I.A. in December-January; one per farm. In Hillston a grid of killer baits was established in September.

A mobile misting unit, using malathion and protein yeast hydrolysate, was in action from September, 1961, to May, 1962, in all localities when fruit fly occurred.

A programme of male trapping and spray bait application, initiated at Narrandera in early spring 1960, has continued for the past two years. No infested fruit has been found since this campaign commenced, although infestation was heavy in the 1960 autumn, prior to commencement of the work, and infested quinces were seen in July, 1960, in a town garden. During 1960-61 two male flies were caught in one of the traps, and one fly was caught late in the recent season.

A similar pattern of events has occurred in the M.I.A. towns. Except for an infested nectarine found at Griffith, the district has been free of fruit fly maggot infestation. A few male flies have been trapped throughout the year.

At Hillstone, combined trapping and spray baiting has greatly reduced fruit infestation compared with other recent years, but a fly nucleus persists. It is hoped that this can be suppressed in the 1962-63 season.

Fly suppression campaigns at Broken Hill and Menindee, using both male lure and spray baiting have been highly successful. No infested fruit has been found at Menindee. There was a very light infestation mostly on quinces, late in the season at Broken Hill. Spray baiting campaigns in some other towns, in the inland north-west, gave less favourable results. Heavy infestations persisted in some of the towns. Greater emphasis on sanitation and early commencement of spray bait application might bring these large fly populations under control.

A fruit fly closely resembling Queensland fruit fly, and which has been trapped with Willison's male lure and malathion in South Australia, was recorded for the first time in similar traps located at Menindee and Broken Hill. This fly is known as Newman's fruit fly, *Noedacus newmani*. It was first recorded in West Australia in 1918 and breeds in wild fruits. More recently it has been trapped at Bourke, Leeton and Barellan.

Fruit Fly Post-harvest Treatments.—Investigation in co-operation with Division of Horticulture and the C.S.I.R.O. Division of Food Preservation continued at the Citrus Wastage Research Laboratory, Gosford. In August, 1961, New Zealand approved, in principle, EDB fumigation of unpacked oranges, as a quarantine treatment for imports from Australian areas affected by fruit fly.

Fumigation of packed fruits was further investigated, with satisfactory results. New Zealand will be asked to approve EDB fumigation of citrus fruits after packing (and washing, waxing, wrapping, etc.), to make the process much more practicable.

Comprehensive instructions on design, testing and operation of commercial fumigation chambers have been prepared by the investigators.

Some limited studies of fruit injury by EDB emulsion dips have been commenced.

The studies on post-harvest treatment of oranges are virtually complete, and the project will probably be re-organised for comparable studies on lemons, mandarins, grapefruit and pears.

A dipping trial to examine the potential of a new systemic, NPH.83, for inhibition of fruit fly larvae in artificially infested apples was done in August-September, 1961. NPH.83 (at 0.05 per cent) was ineffective; whereas Rogor (0.04 per cent) and Lebaycid (0.05 per cent) dips completely inhibited larval development, even after artificial infestation three weeks after treatment.

A similar trial in September-October tested a fresh sample of NPH.83 (at 0.05 per cent) and Sevin (0.1 per cent), Gusathion (0.05 per cent), Zectran (0.1 per cent) and Rogor (0.04 per cent). The Rogor treatment was completely effective, even after artificial infestation 3½ weeks after treatment. The other treatments had no worthwhile effect, although the Gusathion showed at least some activity at larval inhibition.

Similar work, commenced in May, 1962, examined the dosage-mortality response of Queensland fruit fly to Rogor emulsion. Results are not yet available.

Work on fruit fly sterilization of bananas, by dipping, was finalised last year except for determination of Rogor residues. This was arranged with the manufacturers of the product The analyses showed that Rogor residues in the edible fruit were not harmful and were well within safe limits. Rogor and Lebaycid may therefore be accepted as quite satisfactory commodity treatments for bananas.

Banana Rust Thrips (*Chaetanaphothrips orchidii*?) *on Citrus.*—In March, 1962, at Jilliby, banana rust thrips, provisionally identified as *Chaetanaphothrips orchidii* (Moulton), blemished the rind of citrus fruits. The thrips fed on the rind in late summer-autumn, mainly at points of contact between two fruits, but sometimes where a leaf covered part of the fruit. They caused a severe brown blemish. Unlike *Heliothrips* they left no excrement. Blemishing around the stem end was noted; presumed due to early infestation, in October-November. A survey showed serious infestation on a few properties in a limited area.

Some limited spray trials were carried out on Valencia orange trees in March, using dieldrin emulsion at 0.05 per cent, 0.025 per cent and 0.017 per cent, and dispersible sulphur (4 lb./100 gallons). All treatments checked infestation satisfactorily but a lot of blemishing had already occurred. Next season it will be necessary to test a number of programmes. One will be dispersible sulphur in the October Bordeaux application, followed by 0.05 per cent dieldrin early in February.

White Wax Scale (*Ceroplastes destructor*).—The screening trial of insecticides for control of white wax scale continued at Kulnura, on Valencia oranges. The usual thorough spraying when most of the larvae were on the leaves was done. Larval infestation before treatment and adult infestation after treatment were estimated.

Zineb, at miticide strength, combined with the white oil 1/50, has not affected white wax scale control. The new organic phosphate Imidan has given an outstanding result. Thiodan shows no promise. Ethion-in-oil formulation has performed satisfactorily. Ethion and Trithion have not been affected by combination with Bordeaux mixture. Efficiency of Rogor may have been reduced by combination with Bordeaux, but not much. Malathion combinations with the spreaders "Mobilcer M", "Multifilm X77" and glyodin have performed as well as the accepted malathion + white oil 1/100 combination.

Citrus Red Scale (*Aonidiella aurantii*).—Final results for the 1960-61 experiment, on Valencia oranges at Yanco, were obtained at fruit harvest in October. They followed the results estimated in June, 1961.

A further experiment was set down on these trees at Yanco in February 1962 as a screening trial, and to an improved design. The new organic phosphate Imidan was tested alone as a wetttable powder, and as an emulsion in combination with white oil 1/100. An ethion-in-oil formulation was also used; also a reduced strength of Rogor, 0.025 per cent wettable powder + white oil 1/100, as was Rogor at 0.05 per cent wettable powder + white oil 1/100. The effect of various spreaders was tested, by using trithion in combination with glyodin, "Multifilm X77" and "Mobilcer M"; as well as in the standard combination with 1/100 white oil. The results of this experiment are awaited.

Citrus Rust Mite (*Phyllocoptruta oleivora and Phyllocoptes* sp.).—An infrequently recorded form of rust mite provisionally called yellow rust mite, and which appears to be

a *Phyllocoptes* sp., showed up in many orchards at Gosford, Kurrajong and Maroota. Previously it had been most often seen in Newcastle district.

The yellow mite attacks all varieties of citrus, and has been seen in significant numbers in every month from November to July. It causes a dirty brown, sometimes scabby blemish, usually on the inner sides of fruits.

Spray applications of zineb 1 lb. per 100 gallons, Eradex 0.05 per cent w.p., Zectran 0.025 per cent w.p., sulphur 4 lb. per 100 gallons, Morocide 0.05 per cent w.p., Thiodan 0.05 per cent emulsion, Rogor 0.05 per cent emulsion, ethion 0.06 per cent in oil 0.9 per cent, and white oil 1/40 were made in late March at Somersby. This was too late to stop fruit marking, but kills could be assessed. The white oil and the Rogor treatments were not at all effective, and Zectran was not as good as the other treatments.

In laboratory experiments, good kills were obtained also with Kelthane EC 0.025 per cent and above, but Kelthane w.p. was much less effective at the lower concentrations. Chlorbenzilate EC, Imidan EC, and endrin all gave good results. Tedion w.p. was unsatisfactory. Addition of copper oxychloride reduced zineb's efficiency.

Excellent control of common brown rust mite by zineb was seen in a Terrigal orchard in September, 1961. Zineb w.p. 1 lb., malathion w.p. 4 lb. and white oil 1 gall. in 100 galls., was used in mid-February. The malathion + oil was in for scale control.

Silver Mite (Hemitarsonemus latus) of Lemons.—A recently recorded eriophyid, known as citrus yellow rust mite but not yet identified, was confirmed as important in the "silver mite" complex of lemons. *Hemitarsonemus latus* (Broad Mite) again caused important damage. Nothing definite was obtained on the role of *Tenuipalpus californicus*, but it appears not to be very signficant on the coast.

It appears that a programme to prevent "silver mite" damage to lemons should include miticide applications in October-November against yellow rust mite and in January against both broad mite and wellow mite; and another application may be required in autumn against yellow rust mite.

Fuller's Rose Weevil (Asynonychus cervinus) Studies.—Laboratory studies in late autumn and winter were concerned with some features of larval behaviour and with adult food preferences. The egg incubation period ranged from about 2½ weeks at a constant temperature of 80° F. to 4-5 weeks in a temperature around 64° F. Moisture stimulated hatching, and incubation period within an egg mass varied a lot if it were left dry. Newly hatched larvae were strongly phototropic. They were also negatively geotropic, and climbed the straight glass sides of petri dishes without difficulty. These behaviour characteristics seemed to conflict with normal performance of these larvae; they go downwards from the egg mass site on a tree and enter the soil to feed on roots.

The tropisms of the newly hatched larvae may be concerned with emergence from the egg mass. This is normally beneath fruit buttons, between a fruit and leaf surface, or where two surfaces are pressed together.

Newly hatched larvae are very mobile. They move readily over smooth surfaces towards a light source. Test larvae went 2¾ feet in one hour, and over 4 feet in two hours.

Adults collected in late April commenced egg laying in May. They continued to lay throughout the winter in the laboratory, but at a much reduced rate, and the last beetles died at the end of August. Tachinid flies emerged from two beetles but did not appear to have hastened death.

Adult feeding tests with three citrus species showed consistently that weevils would not feed on cumquat leaves in the presence of Eureka lemon or Washington Navel orange, which were equally acceptable. When offered alone, cumquat was very sparingly nibbled.

A large series of potted plants, of 18 different types of citrus, was infested with known numbers of active newly hatched larvae to determine root susceptibility to larval damage. When examined nine months later, no root damage was seen nor were any larvae found. The potting medium had dried out rapidly. It may have been unsuitable for larval survival.

Spined Citrus Bug (Biprorulus bibax).—Laboratory screening tests with various insecticides were carried out. Adult bugs were briefly dipped in fresh insecticide mixtures. They were allowed to dry, then placed in ventilated petri dishes with small lemons, to observe mortality at intervals up to 78 hours.

The following materials gave rapid and complete kill:— Zectran; Rogor E.C.; Malathion W.P. and white oil; Sevin and white oil; Phosdrin E.C.; Dipterex S.P.; diazinon D.P.; Lebaycid E.C.; Dimecron E.C. Less rapid but still effective were: Sevin, Malathion W.P., Gusathion E.C.; Dipterex E.C.; Diazinon E.C. and Ekatin. Some other materials tested were unsatisfactory and very slow to bring about a high mortality. These were: Endrin, Ethion oil, Dieldrin E.C., DDT W.P., DDT E.C.; Ethion W.P., Trithion E.C., Toxaphene E.C. and Pyrolan W.P.

Citrus Gall Wasp (Eurytoma fellis); Systemic Treatments.—This pest, well established throughout the Sydney area, has not spread substantially to Gosford-Wyong but a small infestation has been discovered at Gosford. This is subject of a local eradication campaign.

An experiment has been conducted in the glasshouse, using infested small citrus trees in pots. The soil was treated with the following systemic insecticides: Parathion, 50 per cent E.C., 0.05 per cent; Lebaycid, 50 per cent E.C., 0.1 per cent; Rogor, 30 per cent E.C., 0.1 per cent; Fluoroacetamide, 15 per cent E.C., 0.025 per cent; Sayfos, 80 per cent W.P., 0.1 per cent; Thimet, 10 per cent granular, 0.4 oz. per tree. Application was made on 6th December, 1961, when the wasp's eggs had hatched but before any gall development was obvious. The test trees had been infested in the glasshouse. Adult wasps were within cheese cloth covers over each tree for a couple of weeks in the adult emergence period.

Only Thimet gave 100 per cent control. Control by fluoroacetamide and Rogor was almost complete; the few galls that developed were very small and possibly due to inefficient treatment. The other three insecticides were unsuccessful and not worth further evaluation.

Effectiveness of the following systemics as foliage sprays on infested trees was tested: Metaisosystox, 25 per cent E.C., 00.5 per cent; Fluoroacetamide, 15 per cent; E.C., 0.05 per cent; Rogor, 30 per cent; E.C., 0.1 per cent; Lebaycid, 50 per cent E.C., 0.1 per cent; phosdrin, 100 per cent E.C., 0.05 per cent.

None was successful, possibly because the trees were too small and absorbed insufficient spray.

The following systemics, previously successful in the glasshouse in controlling citrus gall wasp in small trees, were field tested on large trees:— Metaisosystox, 25 per cent E.C., soil application; Dimecron, 50 per cent E.C., soil application; Phosdrin, 100 per cent E.C., soil application; Ekatin, 25 per cent E.C., soil application; Fluoroacetamide, 100 per cent powder, soil application; Metaisosystox, 25 per cent E.C., foliage application of 0.05 per cent spray; Ekatin, 25 per cent E.C., foliage application of 0.05 per cent spray.

Rate of application for soil treatment was 1.6 oz. (fl. or wt.) a.i. per tree. It was an arbitrary rate, the equivalent to 1 gallon or 10 lb. of active ingredient per acre, assuming 100 trees per acre. The equivalent amount of insecticide was mixed with 20 gallons of water for each tree.

One application was made on 21st December, 1961, to a block of infested Eureka lemon trees in a citrus orchard at Oxford Falls. The trees were large, 10-12 ft. high, moderately and fairly evenly infested. The 20 gallons of diluted insecticide for soil treatment was poured as evenly as possibly under a tree. It soaked in with no run-off and, in fact, did not appear to wet the soil enough. No tree injury was observed.

Assessment was made by noting presence or complete absence of this year's galls. No tree, of any treatment, was without galls, and most appeared as heavily infested as in the previous year. The four fluoroacetamide trees had less galls than all other trees.

Fumigation with methyl bromide at standard rates and times has not controlled citrus gall wasp. Hot water treatment at 118°F. for not less than 20 minutes controls the wasp in fully developed galls.

Banana Beetle Borer (Cosmopolites sordidus).—Southward extension of the range of banana beetle borer was discovered. Infestations were found at Coff's Harbour. Eradication action was taken.

A field cage experiment, commenced in March, 1960, continued to compare heptachlor and dieldrin as ground sprays against *Cosmopolites* and to assess residual effectiveness of the two. The rates are: 0.05 per cent heptachlor; 0.1 per cent heptachlor; 0.05 per cent dieldrin.

Following insecticide applications, adult weevils were introduced to the enclosed plots. Treatments were assessed by counts of weevils at traps placed out in plots. Counts taken

Protection of Stored Grain against Pests

In this experiment the wheat was automatically sprayed, with malathion, as it passed on an endless belt into storage. Results have been such that the Grain Elevators Board now uses a malathion spray on all wheat entering Terminal storage at Sydney and Newcastle and, next season, will treat wheat entering country bulkheads. For details of a range of experiments see Entomology Branch notes, page 89.

after one, eight, twelve and twenty-four months indicated effective contact action and a high order of residual effectiveness with each of the three treatments.

Pests of Macadamia Nuts.—Heavy losses are caused by flower caterpillar (*Homoeosoma vagella*), twig girdler (*Neodrepta luteotactella*), nut borer (*Arotrophora ambrodelta*) and fruit pitting bug (*Amblypelta nitida*). Control measures are not known.

Two experiments, with Division of Horticulture, attempted to meet the position. In each, DDT, Thiodan, Lebaycid and Sevin were tested; applied twice, during the flowering and early post-flowering periods, with high-volume equipment (at Duranbah) and with a portable misting unit (at Highfields).

Results suggested that DDT and Thiodan were valuable against flower caterpillars. Trees so treated carried significantly more nuts at harvest than the Lebaycid, Sevin or untreated trees. Sevin and Lebaycid, to some extent, reduced fruit pitting bug injury. DDT and Thiodan gave little or no control of this pest. Nut borer injury was insignificant in each experiment.

Stored Product Pests

Wheat Insects (Sitophilus sasakii, Rhyzopertha dominica, Oryzaephilus surinamensis) Control.—Laboratory trials were commenced in March, 1961, to determine the relative periods of effectiveness of various insecticides as grain protectants against *Sitophilus sasaki* and *Rhyzopertha.* They continued until December.

Malathion (10 ppm) continued to give 100 per cent mortality of *Sitophilus,* but with *Rhyzopertha* only about 25 per cent kill was being obtained at the end of the trial. Mortalities with pyrethrum-piperonyl butoxide (1.7 ppm-27 ppm) had dropped to about 75 per cent for both species by December. Bromodan continued to give 100 per cent mortality of both species at 50 ppm, but mortalities at 10 ppm were only about 50 per cent. This experimental chlorinated hydrocarbon has since been withdrawn because of residue problems. Sevin (10 ppm), although giving poor kill of *Sitophilus,* continued to give 100 per cent mortality of *Rhyzopertha.* Lindane (5 ppm) and methoxychlor (10 ppm) gave poor results and were eliminated after four months.

Two silica-gel compounds, used at 1 per cent by weight, continued to give 100 per cent kill of both species. Magnesite at the same rate gave 100 per cent mortality for three months, and slightly lower mortalities after that.

The following observations can be made:—

(*a*) Malathion appears to be very effective against *Sitophilus* and less satisfactory with *Rhyzopertha.* The latter fact has been verified in the field here and overseas.

(*b*) Sevin is outstandingly effective against *Rhyzopertha.*

(*c*) The generally unsatisfactory performance of the chlorinated hydrocarbon materials, and the residue problem, rule them out as grain protectants.

(*d*) The silica-gel compounds might find some use as seed protectants, at least, and as surface treatments in bulk grain storage.

The organic insecticides used in that laboratory work were used in replicated treatments in 44-gallon drums of wheat at Condobolin Experiment Farm. The trial was established in January, 1961. Insect populations have been slow to build up. At the last sampling, June, 1962, there were generally low populations of *Sitophilus sasakii, Oryzaephilus, Tribolium castaneum, Lasioderma* and *Plodia.* The untreated and lindane treatment showed heaviest infestation. All others were relatively free of insects. Thus, some insecticides which were relatively poor in laboratory trials had repellant action under field conditions. Regular sampling of this trial will continue.

A storage trial established in December, 1955, at Temora Experiment Farm ended with a final sampling in November, 1961. The two treatments of interest were magnesite and a pyrethrum-piperonyl butoxide material. To December, 1959, these had given protection. The final sampling showed that the pyrethrum treatment had broken down. Magnesite had continued to give protection. *Sitophilus granarius* and *Cryptolestes* sp. were the main species in infested bins.

Grain Elevator Board storage trials commenced at the 1960-61 harvest. The malathion treatment (11.95 ppm) continued outstanding. After nine months' storage, there were only slight infestations by *Sitophilus sasakii* and *Rhyzopertha* and no secondary insects were present. In the pyrethrum-piperonyl butoxide (1.7 and 27 ppm) treatment a fairly

heavy general population of *Tribolium castaneum* developed after eight months' storage, with a few *Sitophilus*. The grain from both treatments were considered in excellent condition when trucked out. The untreated and the phostoxin treatment (2 tablets per ton at receival) developed heavy mixed populations and were trucked out by May, 1961.

Following this trial the Board has begun malathion spray treatments of all wheat entering terminal elevators at Sydney and Newcastle, and proposes at next harvest to treat wheat entering the larger country bulkheads.

North-western farm trials reported in 1960-61, ended in July, 1961. Malathion treatments were free of insects, while populations of secondary beetles developed in the pyrethrum treatments.

In a 1961-62 harvest survey of degree of infestation in wheat before it entered Grain Elevators Board Storages, 735 samples from 35 storages representative of the N.S.W. wheat belt were examined. About 10 per cent contained living insects. Most were *Oryzaephilus*. Habits of this species indicate that the infestations arise from insects present in machinery, trucks, etc., before harvest. These would be the nucleus for rapid build up in bulk wheat. Virtually no adults of the other common secondary pest, *Tribolium*, were found. These apparently infest wheat after it enters storage.

To investigate the question of possible field infestation of wheat, especially by *Sitophilus*, samples of unhusked wheat were hand harvested from various Experiment Farms. From fifty-four samples, five showed *S. sasakii* and *Oryzaephilus* infestation. *Oryzaephilus* seemed the main pest to control in pre-harvest farm clean-ups and failure of most chlorinated hydrocarbon insecticides is noted in this respect. Use of some treatment as the wheat enters storage is amply justified; a protective spray treatment or a fumigation. Field infestation possibilities will be further examined.

Flour insects (*Tribolium* sp., *Anagasta kuhniella, Plodia*).—To evaluate local or "spot" fumigants for the control of insects in mill machinery, trials were commenced in March, 1962, at a large Sydney flour mill. Two fumigant formulations were under test, in practical mill conditions—a methyl-bromide-ethylene dibromide mixture, and an ethylene dibromide-ethylene dichloride-carbon tetracholride formulation. These were applied at: (*a*) half the recommended rate, and, one month later; (*b*) the recommended rate of application.

Samples were taken from all elevator boots, and from various other machinery that might be infested.

The first treatment did not give quite satisfactory results. Low populations of *Tribolium* persisted in many of the boots, and some of the feed plates in the reduction rolls held heavier populations. The second treatment, the full rate, gave more satisfactory results, although not 100 per cent. Further sampling of it will be done. A possible reason for the persisting populations is failure to treat any stock conveyers in either treatment, as it was felt that the fumigants would travel from the application points through the conveying system. Further trials will be made in other mills.

Stored Tobacco Insects (*Lasioderma serricorne, Ephestia elutella*).—Effectiveness of DDVP for control of insect pests in tobacco leaf stores was compared with pyrethrum-lindane treatments in use at the bond stores of a large Sydney tobacco firm. Also, trapping records obtained by this firm from nine bond stores since 1959 were studied for data on the seasonal occurrence of the two main pests, *Lasioderma serricorne* (Tobacco Beetle) and *Ephestia elutella* (Tobacco Moth).

The data indicate that the beetles are active from early November until June, reaching maximum numbers in March; with high populations from late February until April. Failure to trap beetles in the winter months indicated lack of flight activity, as leaf from overseas is undoubtedly infested.

Moth numbers were less predictable. For instance, in 1960-61 virtually none was trapped. However, they seemingly appear before the beetles, in October, and disappear early in February-March. Trapping counts showed two peaks; the greater in January-February, and a smaller one in November. Thus, it would seem that two generations occur in a normal season.

The control trials were carried out in two bond stores, each of about one million cubic feet capacity. Each store received twice-weekly applications of the same treatment, from January to June. Continual introduction of infested leaf makes 100 per cent control impossible. However, DDVP treatment more effectively kept the population down. Trap counts were about 50 per cent lower and knockdown much higher than in the pyrethrum-lindane treatment. Costs were about equal at the rates used.

Vegetable Pests

French Bean Fly (*Melanagromyza phaseoli*).—The seed treatment method of protection was further tested at Terranora, using endrin. Main aim was to assess the effect of endrin dipping on germination. In a similar trial at Terranora last year germination was poor. The trial is incomplete, but counts in June indicated that with the dipping method used, thorough seed wetting without shaking the endrin container, germination was not impaired. The effect of endrin treatment on germination is to be further examined.

Misting Machines in Tomato Pest Control.—In this work, at Gosford, combined sprays of DDT emulsion plus Rogor emulsion plus copper oxychloride plus Shirlan AG were used satisfactorily, at both misting and high volume concentrations. The mist treatments gave good control of insect pests and diseases and used less insecticide and fungicide than did high volume spray application.

Effect of Insecticides on Cucurbits.—Several applications were made to cucumbers and rockmelons in December at about weekly intervals, using Thiodan W.P. 0.05 per cent, ethion W.P. 0.05 per cent, Sevin W.P. 0.05 per cent, Zectran W.P. 0.05 per cent, Rogor emulsion 0.05 per cent, Lebaycid emulsion 0.05 per cent, Trithion W.P. 0.03 per cent and Ekatin emulsion 0.02 per cent. No plant injury was seen.

Aphids—Distribution and Taxonomy.—An aphid trapping programme continued. In three traps at the Rydalmere site weekly aphid counts were taken for the year. At Dural, five traps were put into a commercial tomato crop in November and counts made at two to three week intervals to the end of May.

At Rydalmere, 1,653 aphids were trapped in the 12-month period. There were 42 identified species and a few not identified. In the previous year (traps in position only from 11th October, 1960—a total of 34 weeks) 3,103 aphids were trapped. They comprised 32 species.

As in the previous year, there were this year two very strong peaks in number of specimens as well as of species trapped —October and April. Several new records for the Sydney region were: *Dysaphis apiifoliae, Schizaphis cyperi, Schizaphis* (*minuta?*), *Capitophorus hippophaes* s.sp. *mitegonii, Myzus cymbalariae* and *Rhopalosiphoninus staphyleae*.

In the Dural area the five traps were only in position from 23rd November, 1961, to 21st May, 1962 (just over five months). A total of 642 aphids was trapped in 30 species. The species composition differed from that at Rydalmere.

The peak catch periods at Dural were December-January and March-April. Additional new records were *Rhopalosiphum nympheae* and a single specimen of a *Eulachnus* species. This genus has only once before been recorded in Australia when specimens were taken from young pine trees as Casino. According to the Dutch authority, Hille Ris Lambers, it belongs to a complex of S.E. Asian species and is probably undescribed. The single specimen taken at Dural was very similar to this species.

The large number of species (30) taken from the relatively homogenous tomato crop was surprising. Many of the aphids trapped do not have tomato as a host. Evidence suggested that most of the species caught in the traps do land and feed at least briefly on the crop. Winged aphids were taken from the plants themselves. Many were feeding, and occasional first instar nymphs were observed, even when regularly sprayed with Metasystox or Rogor. Fifteen different species were collected in this way.

Individual trap catches were highly variable, even when placed a few feet apart. But, at Dural, differences between traps were consistent over the period. Some traps regularly caught many more aphids than others. One trap was consistently well below all the others in numbers caught. Preliminary examination of these differences indicates that winged aphids do not spread evenly throughout a paddock but invade the area in streams, probably related to convection currents.

Counts of tomato plants showing yellow top virus were made at intervals and an attempt has been made to relate these to numbers of *M. euphorbiae*, a known host of the virus. One block treated regularly with Rogor showed about 5 per cent yellow top virus; blocks treated with Metasystox showed 10 to 4 per cent infection respectively.

Early spread of yellow top virus in January was probably due to alate forms of *M. euphorbiae* and inefficiency of insecticides in this respect. The main value of a systematic insecticide appears to be to prevent colonising of plants by the aphids.

Insect Pests in Floriculture

Azalea Leaf Miner (*Caloptilia azaleelea*).—Two spraying trials, at the Royal Botanic Gardens, were to find a spraying schedule for control of azalea pests. The trials compared DDT 0.1 per cent, Thiodan 0.1 per cent and Lebaycid 0.05 per cent, applied at three-week intervals, and DDT 0.1 per cent at two and four-week intervals.

DDT 0.1 per cent effectively controlled the leaf miner at four-week applications and was superior to Lebaycid and Thiodan at three-week applications. Assessment of control of other pests was not possible. They did not occur on sprayed or unsprayed plots.

Field and laboratory studies of the insect's life cycle and habits have been made and recorded.

Mushroom Insect Pests

Spraying mite infested beds with DDVP effectively controlled Tyroglyphid mites attacking the grain spawn in uncased and cased mushroom beds in May. The rates were one and two fluid oz. of 50 per cent DDVP emulsion concentrate to 3 gallons of water per 500 sq. feet of surface. The beds are now efficiently producing mushrooms, with no yield difference between treated infested and untreated uninfested portions. At least two applications at the two fluid oz. rate, at an interval of a week, are suggested.

One spraying with DDVP, used as for mites, plus some space spraying and surface treatment of resting sites controls *Sciara* flies. Some 50 per cent of mushrooms are now grown indoors. This assists the control practices where DDVP is used.

Domestic Insect Pests

Mistletoe Brown Tail Moth (*Euproctis edwardsi*).—Late in the summer and in the autumn severe skin irritation affected residents in the outer western suburbs of Sydney and in the Penrith area. It was thought to be associated with presence of gum trees. But evidence indicated that *Euproctis edwardsi* was responsible. Little was known of this insect, so a programme of investigations was commenced in March. The insect is widely distributed in the Sydney region.

The skin irritation is a papulo-urticarial rash. It may persist for up to a week. It is caused by minute barbed hairs or spicules, in dorsal tufts on the caterpillars. The spicules, readily detached, are borne by air currents. Most trouble appeared to come from cast skins and pupal cocoons situated under the bark of eucalyptus or on fences, etc.

Euproctis appears to be very heavily parasitised. Two species of unidentified parasitic wasps have been bred from eggs. Larvae in the laboratory have been parasitised heavily by another unidentified wasp species. Laboratory colonies were also severely affected by the parasitic fungus *Beauveria basseana*, but whether this occurs in the field is not known. Pupae collected in the field have yielded numbers of unidentified Braconid wasps as well as the Ichneumonid, *Echthromorpha intricatoria*. Similarly, a species of Dermestid is commonly in association with the pupal cocoons and possibly predates directly on the pupa. Probably a *Fradoma* species, it has been observed in every investigated field infestation of *Euproctis*.

Destruction of mistletoe appears to offer the best chance of controlling the pest. Two methods are available—hormone spraying or lopping. The latter is the only one applicable in built-up areas. Penrith Council may organise a community effort to destroy mistletoe in the worst-affected areas.

House Flies' (*Musca domestica*) *Insecticidal Resistance Studies*.—Multi-resistant house flies (to DDT, dieldrin-BHC and diazinon) are being cultured for screening and toxicological tests. The main interest is to ascertain whether diazinon-resistant flies will increase their order of resistance when placed under pressure from this insecticide.

The strains at the insectary are about eleven times more tolerant to the chemical than are susceptibles. Increased resistance, probably based upon polygenes over a single gene background, has resulted from the selection programme; approaching a factor of two above their former level when first selected for homozygous resistance to diazinon.

The selection programme is linked with the diazinon selection project on *Lucilia cuprina* and it aims to show that flies with resistance to diazinon respond to increased concentrations in control programmes. In contrast, DDT and BHC-dieldrin resistance implies virtual immunity from DDT or dieldrin.

Fly numbers were drastically reduced and held at a low level over the summer months in poultry sheds near Dural by use of DDVP fly cakes.

Diazinon resistance, and DDT and BHC-dieldrin resistance have been demonstrated in fly cultures established from larvae collected at Casino abattoir. The resistances followed incorporation of diazinon into effluent and sprayings with BHC and DDT.

Argentine Ant (*Iridomyrmex humilis*) *Eradication Campaign*.—The Argentine Ant Eradication Bill, first introduced into Parliament in March, 1961, was passed and received assent in May, 1962.

When spraying in the experimental eradication campaign ceased in November, 1959, only one reported area of infestation remained to be sprayed. Now there are 35 reported areas of infestation, some 950 acres, to be sprayed. Seven of these, about 200 acres, were reported between July, 1961, and June, 1962. This has been a severe set-back. The position resembles the situation in 1957. Likelihood of ultimate success has been much reduced.

Survey of the new areas of infestation was completed early in April, 1962. Spraying around houses was then begun and has been carried out between April and June in fifteen areas in the municipalities of Rockdale, Holroyd, Fairfield, Bankstown, Auburn and Drummoyne. In addition, some 35 acres of infested swamp in Rockdale's President Avenue area of infestation, cleared at considerable cost by Rockdale Council, was cover-sprayed for eradication between January and March, 1962.

Animal Ectoparasites

Stable Fly (*Stomoxys calcitrans*).—Opportunity was taken during a severe outbreak of stable flies in the "Hills" area in the summer to ascertain the value of spraying cows with 0.5 per cent DDVP in oil. The insecticide was rapidly (within 15 to 30 seconds) lethal to the biting flies, but gave no residual protection of note. Within an hour flies, apparently with no effect on them, were again attacking the animals; at least they were able to complete their engorgement.

No satisfactory repellent is available to protect animals from *Stomoxys calcitrans*. Spraying the walls of milking and feeding sheds with residual applications of diazinon will reduce the population, but it is of doubtful merit, for in plague years the flies exist in large numbers. Breeding sites are not fully known, although calf pens and stalls containing straw contaminated with manure are favourable larval feeding sites.

Sheep Blowfly (*Lucilia cuprina*) *Insecticidal Resistance Genetic Studies*.—Most selection advances for improvement of productive characters in animals are due to the additive influence of many genes. Therefore it has been speculated that the explanation of resistance in terms of single genes (with the added thought that resistant mutants were present in the field prior to the use of the modern insecticides) is contrary to expectations.

To test the speculation, larvae of *Lucilia cuprina* from recovered susceptible strains are being exposed at each second generation to dieldrin. The susceptibles are recovered following segregation, after test-crossing hybrid flies to susceptibles. The experiments are commenced by crossing resistant females x susceptible males.

Recovered susceptibles are termed T strains. These are carried forward in two sub-colonies:—

(i) T-U is cultured without exposure to dieldrin;

(ii) T-di is cultured with dieldrin selection at each second generation.

T-U strains have been held for as long as ten generations without it being possible to diagnose resistant flies. The procedure adopted here is to apply a dose of dieldrin that is lethal to susceptible flies (namely, 0.02 per cent dieldrin) generation after generation. Complete mortality has resulted, and the conclusion is that the colonies have remained susceptible.

In contrast, T-di strains have been yielding resistant types obtained in T_1 and T_9 series at the 6th and 8th generation. More recently, in a T_8 series, some flies at the 3rd generation have survived the low discriminating dose of dieldrin.

Surviving flies in the T_9 series were held to establish a further sub-colony and have been selected towards RR resistant types. Males able to tolerate 0.4 per cent dieldrin, and therefore RR types, were crossed with field resistant flies (M_3RU—containing the original field resistance gene) and have been bred through to the F_3 generation. The strain known as T_9 A.T. is homozygously resistant to dieldrin.

Provided contamination is not the source of resistance in this new strain, or that further modifying genes have not interfered with the expression in the T-U strains, then exposure of "susceptible" larva to dieldrin has resulted in dieldrin resistance and transformation or an increase in mutation rate has occurred to explain the origin of resistance in the T strains.

Nevertheless, since this study has practical implications, ranging from speed of development of field resistance problems to alternation of sprays as a means to delay resistance, a further series on transformation has been commenced. T_3–U and T_3–di strains have again been started. This time there is evidence of resistance at the 3rd generation in the T_3–di strain; again no resistance in the T_3–U strain.

It is emphasised that a laboratory susceptible strain (L.S.) has been now held for 101 generations without any change towards resistance. This conclusion is based on the periodic treatment of flies with 0.02 per cent dieldrin, without survivors. This level of insecticide discriminates against susceptible flies.

Susceptible and resistant flies of *Lucilia cuprina* have been selected for almost fifty generations without more than an indication of low order vigour tolerance. Resistance to diazinon has not resulted where the insecticide has been used largely as a larval selective agent. No attempt has been made to select both larvae and adults.

Diazinon is still the insecticide of choice for chemical prevention of fly strike. Two alternative but related OP compounds were registered during the year, namely, Lujet and I.C.I. 800. The former, in particular, has shown promise in field trials by the firm concerned.

There is no proven instance of resistance to diazinon in field populations of *Lucilia cuprina;* furthermore, laboratory-selected strains have remained susceptible to the chemical.

Fly dressings based on diazinon in either the wet or dry form appear to be satisfactory for actual control of strikes. Interest is being taken by some firms in the use of carbamates for fly dressings, in view of the residue problems currently under consideration.

The Insect Collection

This year, 5,623 new specimens were mounted and 5,386 of these have been incorporated in the Collection, leaving 237 to be added. In addition, 4,479 specimens (mostly weevils) have been remounted owing to ravages by virdigris or faulty pinning. A total of 114 tubes of insects, etc., have been added to the spirit collection.

The remainder of the Family *Curculionidae* was re-arranged; 9,077 specimens were included in this re-arrangement, and large numbers of weevils will be added later.

Twelve drawers have been set out in the ultimate form which will be used for the Collection, and shown on Open Day. Three hundred and fifty labels (other than locality labels, etc.) were written for the collection. A total of 81 boxes mostly of insects, etc., were sent away.

The *Epilachna* story has been carried further by Li and Cook (The *Epilachninae* of Taiwan, *Pacific Insects,* Vol. 3 pt. 1, pp. 31-91). They have changed the genus to *Henosepilachna.* In a letter, Li has reported finding the following species in Australia: *H. sparsa* (Herbst) = *Epilachna sparsa* 26-*punctata; H. philippinensis* subsp. *australica* (Dieke); and *H.* 28-*punctata* (Fabr.) if *H. Philippinensis* (Dieke) is a good species.

All specimens of the genus *Stephanitis* found on azaleas around Sydney are clearly the introduced *S. pyrioides.* The *S. queenslandensis* has only been found as far south as the Gosford district and on native plants. Past records in the Pest Survey should be disregarded at the specific level unless confirmatory evidence is available.

Sciarid larvae found attacking some glasshouse plants have been identified by D. H. Colless as *Bradysia* sp.; a specific name must await revision of the genus. Various members of this family are known as pests in greenhouses in other countries and some are quite important.

Chemistry Branch

Cereal Section

The Wheat Crop 1961-62 (*25 Pool*).—A total of 67.6 million bushels were received by the Grain Elevators Board. Nineteen million bushels were classified as off-grade wheat of low bushel weight and shot or sprung wheat.

Only 3.5 million bushels of wheat were in bags; in the main for local premium sales.

Export Wheat and Flour.—In co-operation with the marketing authorities, samples were again examined for certification of export wheat shipments. Export and Import Branch employed extra Quarantine Inspectors for the required continuous sampling at Terminals.

Since the first contract with mainland China in January, 1961, 71 shipments involving over 30 million bushels of wheat have been exported to there from New South Wales and certified by this Department. The total included 36 shipments (18 million bushels) from January to June, 1962. Certifications or analytical data have also been requested for shipments to Beirut, Spain, South Africa and India, indicating an increasing trend amongst wheat purchasers to require some form of Government certification, as by other major wheat exporters.

Requests for export flour certificates have gradually declined in recent years in keeping with less export of Australian flour and are now about 30 per cent less than ten years ago.

Falcon Variety's Milling Quality.—Due to adverse comments on milling quality of Falcon wheat, recommended in 1960 for trial sowing in some southern zones, the cereal chemist convened a meeting in August, 1961. The aim was agreement on this matter prior to the annual Standing Advisory Committee meeting. The Wheat Improvement Committee of the Flour Millers Council, the New South Wales Bread Research Institute, the Agricultural Research Institute, Wagga, and Division of Plant Industry were represented.

Final agreement was not reached on Falcon's future from a commercial standpoint, but it was agreed that in Falcon the breeding programme had achieved a better baking quality wheat for the south. It was acknowledged as a hard variety and one that baked well at high protein level. The trade representatives agreed generally with the Departmental laboratory assessment, but cautioned that Falcon's good yield and good baking have to be weighed against high maltose and increased starch damage.

The New South Wales Standing Committee on Wheat in August, 1961, agreed with major changes recommended by the Department. Accordingly, the number of varieties recommended in New South Wales was reduced.

The question of recommendation of Falcon centred on what effect this hard wheat would have on marketing of southern crops. Grower representatives strongly supported segregation principles, and exclusion of hard varieties from the south. This, and objections to the variety's milling quality, led the Standing Committee not to agree on full recommendation of Falcon. Finally, Falcon was again recomended for *trial* sowings.

Further Falcon material from the 1961 season has been laboratory tested. The findings, plus results of collaborative testing from four other testing institutions and three commercial millings, are now being assessed. They will be available for the 1962 meeting of the Standing Committee on Wheat.

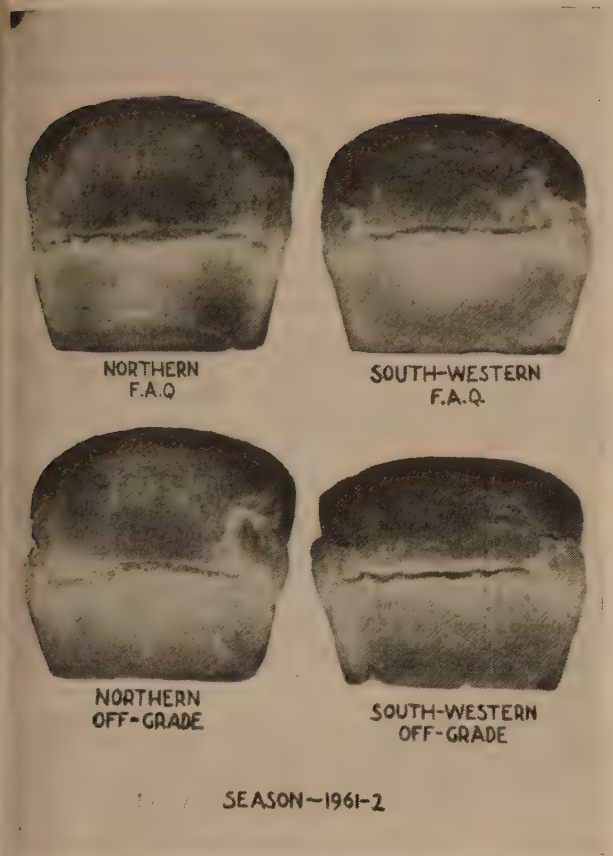
Grain Quality Investigations.—Emphasis this year has been on methods and techniques, due to re-equipping the laboratories, and the need to establish methods suited to the new equipment. The Branch has co-operated in surveys designed to standardize cereal testing techniques throughout Australia, a matter receiving support from the Wheat Industry Research Council of Australia.

Royal Agricultural Society Show.—The Commonwealth Championship for strong wheat was won by a sample of Winglen, the dual-purpose winter wheat bred by the Department.

The cereal chemist attended several meetings of the Agriculture Section Committee of the R.A.S. This committee finally approved that the Society's field wheat competitions would accept only the wheat varieties included in Departmental recommendations. This decision should reduce the publicity otherwise given to non-recommended varieties.

Wheat Production and Marketing Committee of New South Wales.—The cereal chemist is a member. The Committee this year considered segregation of wheat receivals, licensing of varieties, variety release and control, and other matters relating to wheat production. The Committee gained information from many sources, received deputations from the Wheat Growers organisations and the Flour Millers Council, and called for information from grain handling and marketing authorities, and from Departmental personnel.

Soft Wheats, Quality and Sources Investigation.—Due to the increasing demand for flours of specific characteristics to meet the needs of the biscuit, cake and allied trade, a research worker will be allocated full time to the problem of specification and source of this type of wheat. The New South Wales Wheat Industry Research Committee has granted funds to the Department for the appointment.



Segregation got a good Work-out in the Receiving and Marketing of the 1961 Wheat Crop

The 1961 conditions made necessary: a Northern "Fair Average Quality" (63¼ lb. per bushel weight), a Northern "Off-grade" (59 lb.), a combined Southern-Western "F.A.Q." (61 lb.), and a Southern-Western "Off-grade" (57½ lb.) as well as Premium wheats and some "Third Grade" (50-54 lb.). So, at least six classes of wheat were segregated.

Investigation of Possibilities of Segregation on Quality.—Further samples were obtained at the 1961-62 harvest, through co-operation by Grain Elevator Board silo agents. Samples numbering 4,500 were taken from 45 silos.

Full quality evaluations have been made on the various composites from 15 selected silos. These show milling quality differences between the hard and soft segregates, with, in general, better baking quality for the hard segregates.

Interesting relationships have been found between protein, density and visual hardness.

The results have been presented in an interim report to the Australian Wheat Industry Research Council. The Council granted funds to the Department for this research.

Pesticides Section

Removal of Spray Residues from Pome Fruit.—These investigations comprised:—

(i) Successful establishment of methods of analysis for spray residues of the following pesticides: sevin, systox, glyodin, melprex, kelthane, karathane, and tedion.

Satisfactory methods have now been established for residues of each of these pesticides.

(ii) (*a*) Analyses still proceeding, of samples from apple cleaning trials at Bathurst Experiment Farm, the apples having been sprayed respectively with gusathion, trithion, kelthane, captan, tedion, and sevin. Two varieties of apples and, for each, three different washing or brushing treatments are in the tests.

(*b*) Analyses of normal commercial samples of apples, from Batlow, Griffith and Orange, which had been sprayed with kelthane, tedion, or mercury.

No abnormally high residues have been found. Results are being collated for publication.

Insecticide Residues in Milk and Fat.—The extent of dieldrin incidence in the milk and fatty tissues of animals grazing on pastures treated for control of *Amnemus* weevil is being investigated.

DDT Crystal Size in Cattle Dip Formulations.—Further investigation of DDT supercooled melt type of formulation has confirmed the importance of the form of DDT in the dip. Earlier, colloidal DDT seemed the most biologically efficient form. Later, macro-crystals which form when the dip ages seemed more important. However, this year's investigations have indicated an intermediate-size DDT crystal as the most biologically efficient.

Dip Formulations Tested on Flour Beetles.—Flour beetles (*T. confusum*) were used in-vitro to measure biological efficiency of cattle dip formulations. The tests have shown the nature and type of surface active agent used to stabilize suspensions and emulsions of pesticides in water, and to wet the insect and plant surfaces, to be very important. Now that use of DDT and other chlorinated hydrocarbon dips has been largely discontinued, attention has turned to organic phosphorus compounds.

Misting, in Vegetable Crops.—Investigations of misting for control of blight on trellised tomatoes continued at Narara Horticultural Research Station, in co-operation with the Biology and Entomology Branches. The high volume technique typically used by farmers provided the comparison. Copper oxychloride (dispersible powder) was applied in combination with two insecticides, Rogor and DDT (emulsifiable concentrates).

The previous season's work had shown that misting does deposit on plant surfaces much larger (and probably excessive) amounts of copper fungicide than does high volume spraying. With misting there is practically no loss by run-off. Also, in misting the formulation is more concentrated. Coverage of the plant either by mist or spray appeared satisfactory, in terms of copper deposition and biological control. Losses by weathering were significant, for each method; about 50 per cent of the deposit from each weekly application was lost in the following week.

Current work aimed to: (i) find a minimum safe dosage of copper for tomatoes, using misting; (ii) confirm or disprove a long-standing recommendation of increased copper about half-way through the growing season for better biological control; and (iii) to ascertain visually, for both methods, the copper coverage achieved, and the degree of fungus sporulation on the plant surfaces throughout the growing season.

Preliminary assessments of results indicate considerable savings in materials, time and labour, by adoption of misting for trellised tomatoes and similar crops.

Arealimiter Devised.—During the investigations into the application of fungicides to tomato crops, a simple photo-electric apparatus was devised to measure small leaf areas. The method is quick and accurate, and can be used to assess spray coverage of leaf surfaces.

Standards for Pesticides.—The Chemistry Branch continued to be represented in the Committee for Pesticides. Phenoxy-acetic acids for weed control, and phenothiazine for control of worms in sheep, were under attention this year.

Phenothiazine Sheep Drenches.—Importance of surface area and purity in relation to biological efficacy of phenothiazine formulations is now well established. These properties can vary considerably. They vary with the manufacturing source, and the treatment (e.g., grinding) given by the various manufacturing and formulating firms. A farmer using an inferior product could incur considerable loss. Establishment of certain minimum standards both for surface area and purity could eliminate this risk.

Quality of the various products currently on the market is now being surveyed. So far, 17 different brands have been examined.

Water Section

The Water Analyses Service.—A total of 977 samples of water were analysed at the Rydalmere laboratory, 12 per cent more than in 1960-61. The Regional water-testing services were also well patronised by landholders and Government bodies. This decentralised service, in the nine Agricultural Regions, dealt with about 1,500 samples of water and soil: analysing, and advising by written report on the suitability of water for stock and irrigation use and salinity of soil relative to crop production.

Regional, Water Testing Specialist Appointed.—Appointment, this year, of a special officer designated "Agronomist (Water-testing Scheme)" has strengthened the Regional Water-testing Services. Funds from the Commonwealth Extension Services Grant made the appointment possible. This officer, after in-service training in analytical procedures and interpretations at Rydalmere, took up full-time regional duties in March, 1962.

His duties include: instruction of Regional officers of the Department in the use of water-testing and soil-salinity testing equipment; teaching the interpretation and application of the analytical data; setting up uniform systems of records of water and soil salinity tests in the Regions; attending field days, shows, and Agricultural Bureau meetings, to demonstrate and lecture on water-testing and soil-salinity problems; preparing tape recordings for broadcast, and otherwise contributing to Regional extension services; and initiating and carrying out Regions' research projects, under the control of the Chief Chemist.

Measurement of Soil Moisture Tension.—Research into further uses for the "Salitest" transistorised salinity meter developed by the Branch in co-operation with a commercial organisation in 1960 has recently led to its application in assessing soil-moisture tension in the root zones of crops. Gypsum blocks with monel metal fibre-glass insulated electrodes connected to 6 ft. P.V.C. leads are used.

The blocks are placed in close contact with the soil in the plant root zones. Electrical readings of the meter connected to the leads are interpreted in terms of soil moisture tension, to reveal the ease or difficulty the crops experience in abstracting moisture from the soil.

Pot experiments at Rydalmere indicate that the "Salitest"-gypsum block method of measurement of soil moisture tension could be a valuable irrigation aid to landholders.

Extension Services on Water Testing.—The extension services of this section of the Branch work have been especially notable. They have included addresses and information bulletins for Departmental Irrigation Schools, Agricultural Bureau meetings and schools, Agricultural Shows, and field days, and use of the press, radio, and television facilities.

General and Regulatory Chemistry

Work in this section has involved examination of a wide range of materials, and about 100 analyses of samples. Some required research to develop suitable methods of analysis.

Vitamin A in Stockfeeds.—Further progress has been made in development of accurate analytical techniques for determination of Vitamin A in stockfeeds. In a Vitamin A survey, several samples from city mills have been submitted for testing.

Stockfeeds Supervision.—Examination of samples taken under the Stock Foods and Medicines Act showed that many failed to comply with the manufacturers' claimed specifications or with other legal requirements. In this group were several meat meals and stock foods which contravened the requirements of the Act.

Veterinary Medicine Analyses.—At the request of Division of Animal Industry, samples of a registered veterinary medicine were analysed for strychnine content. The strychnine content was many times greater than was stated in the formula. The Department took action on this breach of the Stock Foods and Medicines Act.

Margarines.—Samples of table and cooking margarine were examined for Division of Dairying to assess the composition of the fat component of six brands of margarine. These figures indicated that the Dairy Industry Act requirements were being observed.

Quality of Furit Wraps.—Further samples of oil-impregnated wrappers for apples and pears were examined, for conformity to S.A.A. Specification N29-1959. As a result, recent supplies of wraps to packing houses have shown much better quality.

Pelleted Feeds Analyses.—In conjunction with Biology Branch, the C.S.I.R.O. Division of Animal Genetics was assisted by assays for aureomycin in pelleted feeds prepared specially for breeding-experiments.

Physico-Chemistry and Isotopes Section

Zinc Determinations.—Investigations are in progress on the use of ion exchange resins in preparation of samples for polarographic determination of zinc. The chemical dithizone has hitherto been used to extract the zinc, but this method has not been satisfactory.

Tests on "Elman" pH. Tester.—An "Elman" pocket Soi Acid Tester was submitted by Biology Branch to the physica chemist, for appraisal. A similar instrument had been sub mitted by the agent to the Soil Section of Chemistry Branch for appraisal.

The instrument is a pH. meter, of Japanese manufacture graduated to read pH. within the range 3.5-8.0. It wa appraised as not being sufficiently reliable.

Procedure Checks with Phosphorous Isotope P-32.—In flame photometry for certain elements of interest to the Soil Section the phosphate concentration in test solutions has to be reduced below a critical level. The test solutions are passed through ion exchange columns which remove phosphate. The columns become saturated and require regeneration at intervals.

Addition of a trace of radioactive P-32 to the test solutions was suggested as a routine for a rapid and simple check on whether the columns are functioning satisfactorily. The results from such checks have also thrown light on the influence of certain variables affecting efficiency of phosphate extraction by the resins. This warrants further study.

Irradiation of Seed to Induce Mutations.—Preliminary experiments, in association with Division of Plant Industry, used the radiations from P-32 to irradiate seeds to induce mutations. Though not yet completed, the experiments have justified further work.

Goitre in Lambs.—Further tests were made in association with Glenfield Veterinary Research Station, using radioactive iodine to ascertain whether goitre in lambs at Crookwell in 1959 was due to goitrogenic activity in the pasture plants. No goitre was observed this year and the tests were again negative.

Activation Analyses, for Selenium.—Glenfield Veterinary Research Station sought help in assessing the possibility of using neutron activation to analyse for selenium. In neutron activation analysis the sample is irradiated in an atomic reactor, and radioactivity induced in the various elements is measured. Generally, determinations are made after chemical separation. The method is extremely sensitive. In this case of selenium, activation analysis to avoid the difficult chemical separation was considered. It is achieved by using gamma ray spectroscopy to distinguish the selenium radiation. But the cost for 100 samples would exceed £500. This would obviously restrict this type of analysis to very exceptional cases.

Low Temperature Sterilization of Soil.—Biology Branch was helped, by assembly of a steam injector for use in apparatus for low temperature sterilization of soil. By mixing air with steam the overall temperature can be reduced to a suitable level for selective sterilization of soil against certain organisms.

Spectrography.—Purification of reagents for use with the large spectrograph has now commenced. This followed installation of a muffle furnace. Preliminary investigations into trace element contents of wood ash will start as soon as the purification work is complete. Several varieties of wood ash supplied by the Forestry Commission will be qualitatively examined, to discover why, on certain types of soils, wood ash is a better fertilizer than the common all-purpose agricultural fertilizers.

Cracked and uncracked rice grain will also be qualitatively analysed; to see whether suncracking in rice is due to nutritional deficiences or excesses. Precise quantitative analysis, on a project basis, may then be justified.

The Colonial Sugar Refining Co. Ltd. has requested a trace element analysis of molasses, in connection with their research project on molasses fermentation processes. This analysis will be undertaken as soon as the needed reagents have been suitably purified.

Lectures on Radioactive Isotope Uses.—These were delivered by the physical chemist, to students of Agricultural Chemistry at the University of Sydney.

Plant Nutrition Section

Sulphur Deficiency Areas.—Many areas are deficient in sulphur. Growers consistently ask when and where gypsum (for sulphur), or sulphur-fortified superphosphate, or superphosphate only, should be used. Research to define the deficient areas, and on methods to determine sulphur deficiency, has continued.

Type of sulphur to be used in fertilizers is also under examination. Pot and field tests have shown that the degree of fineness of sulphur compounds is most important. The time relationship has also proved important. Some of the

very fine fertilizers are readily available to the plant in the first year and quickly exhausted, while slighty coarser materials become available in the second and third year. These results are important to the fertilizer manufacturers, and being used in their formulation and manufacture of new fertilizers.

Citrus Fertilizer Needs in the M.I.A.—Fertilizer needs of citrus trees in the M.I.A. have been studied by samplings over the last two years. Nitrogen, phosphorus and potash variations have been followed at monthly intervals, in spring-flush and non-spring-flush leaves, in Valencia and Navel oranges. Big differences in the nutrient levels in the leaves depending on their age, and on time of the year, have been shown.

It is now possible to specify needs, guided by sampling.

Serrated Tussock Nutritive Quality.—An article has been published on the effect of fertilizers on crude protein content and palatability of Serrated Tussock, one of the State's most serious weeds. Hitherto regarded as unpalatable to stock, Serrated Tussock has now been shown to be palatable when protein content is increased, either with fertilizer from the bag or from Sub-clover association. This work is continuing. Carbohydrate levels in the root are also being studied. These may be important in the weed's resistance to some of the control methods.

Lucerne Lack of Persistence.—In the Taree district this has been a problem, and in recent years several trials have been set up on part alluvial soils along creeks. Samples have been harvested, and analysed for molybdenum and calcium content.

The soils are very deficient in molybdenum. Best plants in the trial are those that received both lime and molybdenum, respectively at one ton and 8 oz. per acre rate. The treatment has raised the plants' molybdenum content to 5 p.p.m. Plants not treated with either lime or molybdenum showed only 0.1 p.p.m. in their leaves—a deficiency level of molybdenum. The critical level for molybdenum in lucerne is considered to be 0.3 p.p.m.

Although lack of persistence of lucerne in the Taree district may often be explained as due to floods or waterlogging, nutrition is obviously important in it.

Apple Nutrition.—Granny Smith apple foliage was sampled at Armidale, Oakdale, Penrose and Batlow at monthly intervals in the growing season. These samples were regularly analysed for N. P. K, and a full analysis was done on December samples.

N P K levels tended to be high in November and December. They gradually declined in January, February and March. In some cases the potash level was higher in the February-March period, a rise possibly associated with harvesting. When apples are removed from a tree, potash levels may increase in the leaves, particularly if there is adequate potash in the soil.

Marked variation in potash levels has been shown, particularly as between apple districts. Leaves from the Orange and Batlow districts usually contain high levels of potash as compared wtih leaves from Armidale, Oakdale and Penrose.

Walcha Pasture Nutrition Project.—The long term research at Walcha and Yarrowitch in co-operation with Division of Plant Industry, into pasture nutrition on the soil of this Northern Tablelands area has given special attention to residual effects of phosphoric and sulphur fertilizers. Useful data have been obtained. Most of the work is now in the final phase. Collation of results is proceeding, preparatory to publication.

Publication of the data is likely to be under eight or nine headings, dealing with: (1) Pasture improvement problems in the district. (2) Plant nutrition status of the soil, (3) Phosphorus and sulphur needs, (4) Induced potassium deficiency, (5) Nodulation problems, (6) Species, (7) Application of results to the district, (8) An economic view of results, (9) Yarrowitch trials.

Sulphur Fineness in Fortified Superphosphate.—Glasshouse trials, and a field trial of Tia, have been completed. Results will be published.

Sub-clover Nutrient Uptake.—Factors affecting this have been studied in the glasshouse. Two soils, one phosphate-deficient and the other with ample, have been given high and low rates of superphosphate and high and low rates of watering. The plants have been harvested and sampled regularly.

By leaf analysis, low watering has been shown to reduce phosphate uptake. The levels of nutrition have also varied with plant age. Some nutrients were high in the young plant and lower as the plant aged.

Citrus Nutrition, Pot Trials.—Yield and quality results have been obtained from the citrus pot experiment at Gosford over the past three years, by analyses. It is a co-operative project, as between Division of Horticulture and Division of Science Services. A report is in preparation. Nitrogen, potash, magnesium, calcium and phosphorus have been shown to be important under the conditions of the experiment. Further work will be designed around these elements.

Orchard Diagnostic Services.—Many samples are received from district fruit officers for mineral deficiency diagnosis by leaf analysis. A wide variety of deficiencies and toxicities has been recorded.

The fruit officers have been supplied with standards showing deficiencies, critical levels, and toxicity levels, for citrus nutrition. These standards, developed by two separate groups in America, have been applied (with some modifications) to local conditions.

Soils Section

Specialist advisory services to field officers and farmers, investigational work on soil testing, and soil surveying of "dry" land and of new irrigation projects are the work of this section. Advisory work has increased slightly this year.

Salts' Characterization.—Characterization of the salts in salted soils has been done in detail. The salts included chloride, sulphate, bicarbonate, carbonate, phosphate and nitrate, among the anions; and calcium, sodium, potassium and magnesium, among the cations. The characterization permits confident recommendation of corrective measures. In the case of glasshouse soils around Sydney it helps to determine what fertilizers have been applied in excessive quantities.

Soil Fertility Assessment Methods.—Investigational work on potash and phosphate assessments continued.

Ways of assessing soil fertility levels in citrus soils are also under research, taking in a range of nutrients (Ca, Mg, K, N, P, Cu, Zn and Mn) on a single crop, rather than a single nutrient (for example, phosphorus or potassium) on a range of crops.

Soils' Phosphate-supply Potential.—Testing of soils to measure their power to supply phosphate continued.

Data in 1960-61 from the 18 Wheat Uniform Fertilizer Trials, mainly from the north-west and central west, showed significant correlation between grain yield (expressed as percentage response) and soil phosphorus as measured by the Olsen and the Saunder methods.

Arbitrary ratings indicating soil phosphate status were accorded to these soils, on the basis of the soil phosphorus test results. All soils rated "High" gave no significant response to fertilizer phosphorus. Soils rated "Low", except one, gave comparatively large responses. Soils rated "Moderate" gave responses ranging from low to high.

The chance that a soil phosphorus test may reasonably accurately indicate a soil's phosphate-supplying power appears to depend on the nature of the results. For example: if the soil is rated "high" or "low", the probability that this is a correct verdict is high; if the soil is rated "moderate", the verdict would remain suspect. The large number of errors inherent in sampling soils, and laboratory tests using empirical methods, may easily put into the "moderate" bracket a soil which is in fact "low" or "high". But extremes of soil phosphorus, a deficiency or an abundance, yield a very good chance of correct rating despite the inherent errors.

On this basis, some routine samples from farmers are being tested for soil phosphorus, and cautious recommendations are being made, using the dilute acid-fluoride procedure of Bray and Kurtz. This solubilizes a similar fraction and amount of soil phosphorus to the Olsen method, and is quicker and simpler.

Soils' Potash-supply Potential.—This work aims to assess a soil's ability to supply potash to plants. It is only in preliminary stages and is essential to the later, main project. Choice of the most suitable crop for pot work, and setting up of correct fertilizer levels for pot work have proceeded.

To select the most suitable crop, nine types of millet were compared for growth, vigour, drought resistance and potash extraction. From this test, Japanese Millet (*Echinocloa crus-tagalli*) was selected. In the preliminaries, fertilizer dressings were seen to be badly adjusted; salting problems became serious when the pots were repeatedly cropped and fertilized.

Fertilizer mixtures were re-calculated, for complete usage of anions and cations; and, in a pilot trial using the seven soils under investigation, no salting has occurred over four harvests. In addition, plant uptake of potassium in the first harvest has enabled soils to be tentatively rated for future pot-cropping.

Soil Surveying.—Detailed surveys of about 60 square miles in the Balranald and Euston areas for irrigated horticulture, and broad scale surveys of 1,700 square miles between Balranald and Euston along the Murrumbidgee and Murray Rivers have been completed. This meets the soil survey needs of the Balranald area for a long time ahead.

Some 300 soil samples from the area were analysed for a range of cations and anions as to chemical suitability of the soils for vines, citrus, vegetables and pastures. Reports have been issued.

A survey in the Rylstone area has begun to determine whether salt and alkalinity are responsible for general pasture failure.

Finding suitable criteria for assessing land use potential, both irrigated and "dry land", is under attention by the soil surveyors. This need for soil surveys to be of more direct value to extension officers and others has been felt for a long time.

Soils Lectures.—Eight lectures were given to 3rd year Agriculture students, University of Sydney, on "Soil Formation" and "Soil Surveying". Also, lectures were given to Agricultural Bureau schools on "Soil Formation" and "Soil-Plant Relations".

Yanco Research Laboratory of the Chemistry Branch

Rice Chemistry.—Samples analysed comprised 225 soils, 360 leaf and 1,300 grain samples; drawn mainly from M.I.A. rice farms.

District soils were studied in experimental concrete rice bays at Yanco Agricultural Research Station. They showed good correlation between soil nitrogen availability early in the growing season and grain yields, plant weights, and tiller counts. Levels of soil available nitrogen dropped to very low values at the period of maximum plant growth, then increased slightly towards the end of season. Soil samples from corresponding commercial areas gave similar results when allowance was made for varied sowing times.

District fertilizer trials showed grain yield response to nitrogen (applied as ammonium sulphate) up to 2 cwt. per acre. The response varied from 18 per cent on lowest fertility soil to nil on highest fertility soil. Effects of phosphorus and potassium (applied as superphosphate and potassium sulphate respectively) were small.

Soil samples taken early, before sowing, were used to estimate fertilizer needs. Grain yield results correlated well with combined available soil nitrogen and added nitrogen (where fertilizer was used).

Grain samples have been obtained for a second grain protein survey of the district. A cooking test will also be done on these.

Fruit Chemistry.—Some 5,000 analyses were done, including 936 nitrogen, 836 phosphorus, and 1,308 potassium analyses, on plant material. Other tests on plant material included 73 for each of the elements: iron, copper, zinc and manganese; and 39 leaf analyses for boron.

On soils, there were 120 analyses for each of the elements: phosphorus, potassium, magnesium and sodium—144 soil organic matter determinations, and 240 for soil nitrogen. Soil pH determinations totalled 311, and soil conductivities the same. Lime requirement analyses totalled 40. Trace element analyses on soils included 33 boron determinations, and 23 each for copper and zinc. Also, more than a hundred analyses were done in relation to various fruit quality tests.

Extension Activities.—For the Irrigation Research and Extension Committee's *Farmers Newsletter*, several short articles were supplied. For example: "Control of Iron Deficiency by Chelates", "Soil Structure", "Soil Analysis and the Farmer". Material from the articles was used also for radio sessions. Two special ten-minute interviews were broadcast by the A.B.C. An illustrated lecture, "Soil Structure", was given to the Orchard Management School held at the Yanco Agricultural Research Station.

Botany Branch

Royal Botanic Gardens, National Herbarium, and Allied Activities

Construction of Expressway

Construction of the Expressway through portions of the Royal Botanic Gardens and Domain has provided many problems for our staff and frequent conferences with the City Council as constructing authority. The Expressway was opened for traffic on 1st March, 1962, but the restoration work has been disappointedly slow. Plans have been prepared for reconstruction of several areas. It is most essential that these be implemented by the constructing authorities with minimum delay.

The Entrance Gates to the Garden Palace grounds were removed during construction of the Expressway. They have new been re-erected on a suitable site fronting Macquarie Street, and a comprehensive plan for the treatment of the area surrounding the Entrance has been adopted. Completion of the Art Gallery bridge provided better access for traffic to and from Mrs. Macquarie's Point.

Royal Botanic Gardens

Improvements.—The area surrounding the middle pond has been redesigned. Plants were removed from overgrown portions, and an area has been prepared as a feeding ground for ducks. Two beds of *Fuchsia* selections were planted out in areas near the glasshouses and kiosk. The twin-ponds were cleaned out and water-lilies re-arranged in them. Thirty new selections of *Gazania* were set out in the Middle Garden, and 50 species of shrubs and trees new to the Gardens were planted in beds and fawns. Eighteen species of natives not previously represented were planted.

A large glasshouse has been constructed in the nursery area to replace glasshouses demolished for the Expressway. The large glasshouse used for the public display of plants has been demolished in preparation for later re-construction.

Glasshouse Displays.—Glasshouse plants continued to attract many visitors to the Gardens. The series of displays of flowering plants, ferns and foliage plants has included "Crotons" (*Codiaeum* spp.), *Fuchsia, Philodendron, Hippeastrum,* and a wide range of orchids including *Cymbidium, Coelogyne, Cypripedium, Cattleya* and *Dendrobium.*

The glasshouse staff again maintained pot-plants to decorate the rooms of the Royal Agricultural Society at the Easter Show, and to decorate several government exhibits. A non-competitive special exhibit of *Coleus* was staged in the Horticultural Hall.

Landscape Gardening Service.—The Landscape Gardener made four country visits for landscaping advice to Narrabri, Gunnedah, Wollongong and Temora.

In the metropolitan and near areas, advice, plans, or reports were given re St. Mary's High School, Sefton High School, Hawkesbury Agricultural College Engineering School, St. George District Hospital, Kurrajong Memorial Park, Mt. Pritchard East High School, Prince of Wales Hospital, Ingleburn High School, St. George Girls' High School, Sydney Technical High School, Leumeah Public School, and the "Daruk" Training School of the Child Welfare Department.

Plant Introductions.—An important function of the Gardens is to introduce new species of botanical or horticultural value. Amongst those recently introduced and successfully grown were *Lysimachia mauritiana,* a "Loose-stripe" from Eastern Asia; *Campanula vidalii,* from the Azores; *Tibouchina granulosa,* from Brazil; *Bergelia lanuginosa,* from South Africa; *Chorisia speciosa,* from Brazil; and *Eucalyptus deglupta,* from New Britain.

The Domains

The playing fields were in great demand. Restoration of the area affected by the construction of the Parking Station has not yet been completed by the City Council, but it has been regraded and turfed.

The Outer Domain was used for parades and assemblies for processions in connection with the Anzac Day Service, Australia Day Procession, Apprenticeship Week Procession, R.A.S. Show Procession, and the Waratah Spring Festival Procession.

Portion of the Domain adjacent to the Registrar-General's building was made available to constructing authorities for work on extensions to that building.

Centennial Park

Maintenance of the great part of this area was satisfactory. Some perimeter portions were of poor appearance. The sporting areas were freely used.

Government House and Admiralty House

These areas were satisfactorily maintained. Several large trees were removed, and special attention was given to fungal and bacterial diseases in flower beds.

National Herbarium

Plant Species New to New South Wales.—The following were recorded within the State boundaries for the first time. Where the species has regenerated itself to any extent within an area it is regarded as having become naturalised and is marked accordingly:—

Aleurites fordii, "Tung Oil Tree", at Central Colo, along creek bank (naturalised). This native of Central Asia has been cultivated in New South Wales for many years.

Anthemis arvensis, "Corn Chamomile", at Richlands, between Taralga and Wombeyan Caves. This native of Europe, Asia and North Africa had been collected on two previous occasions; at George's Creek in 1907, and at Chandler's Peak, Guyra, in 1917, when it was confused with *A. cotula.*

Arabidopsis thaliana, "Thale Cress" or "Wall Cress" (naturalised) in the Canberra area. This European native has been found there as a minor weed.

Cardamine tenuifolia, at Burbong, near Queanbeyan; an annual, native to Victoria and South Australia.

Cicendia filiformis, in swampy ground near Prince Henry Hospital, Little Bay. This low-growing member of the Gentianaceae has been naturalised in Victoria for many years.

Cyperus pilosus, at Byron Bay; a native sedge, well known in Queensland.

Dicrocephala latifolia, at Murwillumbah (naturalised). This composite weed of roadsides and waste places is recorded from tropical and subtropical Africa and Asia through Malaya to Northern Queensland.

Juncus capillaceus, in the Sydney district (naturalised). This small grass-like species is a native of South America.

Leontodon leysseri, at The Basin, Pittwater; a composite, native to Central Europe, recorded as naturalised in Victoria, South Australia and Tasmania.

Paspalum notatum, from roadsides near Blacktown (naturalised); previously received as a species of cultivation on Experiment Farms. It is a native of Mexico, West Indies and South America.

Pultenaea laxiflora, at Weetangera, Canberra region; a native species previously known only from Victoria and South Australia.

Pyrostegia venusta, at Tyagarah, north of Ballina (naturalised); a native of Brazil, cultivated for its bright orange flowers.

Sagittaria montevidensis, an "Arrowhead", at Griffith (naturalised). It is spreading rapidly in drainage ditches and irrigated areas.

Sechium edule, "Choko", at Unumgar, Upper Richmond River (naturalised). This vegetable species, native to Central America, has become established in disturbed rain forest.

Sinapis alba, "White Mustard", in the Canberra area (naturalised). A native of Europe, it has been a weed in America for many years.

Weed Species.—Among the foregoing fourteen records, only five may be regarded as weed species, and only one of these, *Sagittaris montevidensis,* is likely to develop as a troublesome weed. The other four species may become weeds of only minor importance.

A weed which has been spreading in the Maitland district for many years has been determined as *Wedelia glauca.* This may lead to some temporary confusion, as this name has been used for a western weed for many years. Material of the latter, probably a species of *Helianthus,* is being sent overseas for critical study and determination.

Extensions of Range.—Following field observations by botanists and other collectors, and examination of specimens received for determination, the known range of the following species has been extended as listed below. Previous limits are given in brackets:—

Angophora woodsiana, at Well's Crossing, between Grafton and Woolgoolga (southward from the first recording in the Casino district).

Brasenia schreberi, a native aquatic, from Rocky Creek, near Lismore (northwards from the Murray River and Picton Lakes).

Callitris preissii ssp. *murrayensis,* "Murray Pine", at 100 miles north of Bourke (northwards from Pooncarie).

Callitris preissii ssp. *verrucosa,* "Mallee Pine", north-west of Bourke (northwards from Nymagee, Mt. Hope).

Carex capillacea, at Wragge's Creek, Mt. Kosciusko (southwards from high country, probably at the headwaters of the Clarence River; it occurs also in the highlands of New Guinea).

Chorizandra cymbaria, from Wentworth Falls (westerly from the coast).

Cupaniopsis faveolata, from Bulga State Forest, Manning River (southwards from the Hastings River).

Elodea canadensis, in the Muswellbrook district (an extension northwards of this North American native; previously recorded in N.S.W. only in the Murray Valley, where it is naturalised).

Fimbristylis monostachyus, at Austinmer (southwards from the Macleay River district; this small native sedge is chiefly a tropical species found near the sea).

Juncus pusillus, at Gloucester Tops (northwards from the Snowy Mountains).

Pultenaea blakelyi, at Wallengat State Forest, north of Bungwahl (northwards from Martinsville, near Cooranbong).

Pultenaea ferruginea var. *deanei,* in Royal National Park (southwards from Hornsby district).

Pultenaea paludosa, near Sassafras (southwards from Bulli and Appin), and also at Harrington (northwards from Myall Lakes).

Spiculaea huntiana, near Cabramurra, Mt. Kosciusko (westwards and at higher elevation than previous records).

Records of Rare Species.—The following rarely seen species have been added to the collections:—

Goodyera viridiflora, a ground orchid, native to Queensland. It was cultivated, and flowered, at Coff's Harbour. This is only the second specimen of it in the collection.

Pultenaea echinula, collected from King's Tableland; the fourth record of the species, and the first record for fifty-one years.

Restio sp., an undescribed species which was collected only at Woodburn, Richmond River, and Wardell.

Spergularia diandra, in the Glenfield district. This native of the Mediterranean Region has been recorded in this State only once before, at Condobolin.

Spiculaea huntiana, a ground orchid, collected at Cabramurra, Mt. Kosciusko, and at Mt. Victoria. There are only four other specimens of it in the collection.

Exchanges, and Loans, with Other Institutions.—A total of 983 sheets of herbarium specimens was forwarded to seventeen institutions throughout the world. These included duplicates of certain Burmese and New Caledonian ferns collected by Dr. McKee of the C.S.I.R.O., and determined at this Herbarium and forwarded to the Smithsonian Institution, Washington, and the University of California. Some material was sent on request, including sheets of *Oxylobium* spp., to Dr. R. Melville at Kew, England; and a number of the pinnate-leaved groups of *Acacia* were sent to Pretoria.

In exchange, the Herbarium received 705 sheets from eleven institutions. These included tropical American ferns and specimens from Okinawa, a collection of New Guinea species of *Ficus* from Dr. Corner of Cambridge, and a collection of algae from the University of California.

In addition to herbarium specimens, a selection of wood blocks of several species of *Acacia* was forwarded to Dr. G. Roux, Leather Industries Research Institute, Grahamstown, South Africa. He is undertaking biochemical analyses of the material in conjunction with work here on the taxonomy of these species.

Specimens of our collections of *Jussiaea* and *Ludwigia* were loaned to Dr. P. Raven, Claremont, U.S.A., who is making a detailed study of the group; specimens of the pteridpohyte *Gonocormis* (Hymenophyllaceae) were loaned to Brisbane Herbarium and the British Museum; and G. I. Playfair's type material of freshwater algae, collected in the Sydney and North Coast districts, was loaned to Dr. F. Drouet of the Philadelphia Academy of Natural Science. Dr. Rouet has returned a number of these specimens, specially mounted in a permanent medium, to facilitate inspection of these unicellular plants.

Field Collections and Seed Exchange.—The Plant Collector was in the field on 86 days, covering 7,348 miles. Apart from day and part-day collecting trips he undertook six major journeys, of from three to twenty days. The areas visited were the far north coast, the northern tablelands, the northwest as far as the Nandewar Range, and the south coast to Nowra and the Pigeon House Range.

Over 600 numbers of herbarium specimens were collected in bulk, mainly for overseas exchange and 210 seed collections were made, to augment supplies already held for exchange purposes. Considerable attention was given to collecting specific living material of a wide range of species required for cytological investigations by the botanical staff, as well as preserved bud and flower material sought by investigators in overseas institutions.

In response to requests, 475 seed samples have been received from 45 overseas and five local sources. In exchange, the Herbarium despatched 543 samples to 53 institutions. Since the issue of a new Index Seminum, the Herbarium is getting requests from many overseas institutions.

Field Investigations.—Field work carried out by members of the botanical staff included observations and collections of material in Tasmania, North Queensland, N.S.W. north coast and western districts.

Identification Services.—Some 11,000 specimens were identified for the public, other departments and institutions, universities and similar bodies.

The botanical identification service was called upon to help in alleged cases of growing drug plants; the illegal use of drugs; and a charge of entering and stealing, where the identification of plant parts was of particular significanace.

An anatomical investigation of plant material passed through a patient's intestines was undertaken for the School of Tropical Health and Medicine.

Large collections of Australian and New Guinea plants received from the C.S.I.R.O. were determined.

Special interest, of a commercial nature, has been shown in the marine algae. An honorary botanist, Mrs. V. Jones, has been fully occupied in identifying seaweeds collected in areas from Tasmanian to Northern Queensland.

Botanical Research

Three parts of the "Flora of New South Wales" were published during the year. This work is being printed in the *Contributions from the New South Wales National Herbarium, Flora Series.* No. 19, Part 1 contains a key to the native and naturalised genera of the Gramineae, and detailed treatment of about one-quarter of the species. Nos. 21-22 treat the families Palmae and Araceae. Nos. 208-211 treat four families of ferns, the Davalliaceae, Grammitidaceae, Polypodiaceae and Aspidiaceae.

The published parts of the *Flora of New South Wales* have been very well received. Numerous appreciative comments have come from Australian and overseas botanical workers and institutions.

Typescript for the "Flora" has been completed for the families Flagellariaceae, Isoetaceae, Psilotaceae, Osmundaceae, Gleichemiaceae, Cyatheaceae and Azollaceae and awaits the completion of the respective adjacent families before publication.

Work is well in hand on several other families for the "Flora"; including the Restionaceae, Xanthorrhoeaceae, Ranunculaceae, Blechnaceae, Hymenophyllaceae and Dicksoniaceae.

Preparation, for the "Flora", of a revised edition of the work published in 1943 under the title "Orchids of New South Wales" by H. M. R. Rupp is proceeding.

Volume 3, Nos. 1 and 3, of the regular series of the *Contributions from the New South Wales National Herbarium* were published during the year. In addition, Vol. 3, No. 3, has passed all proof stages. It will contain six papers, namely: "Taxonomic Notes on Australian Plants", "Studies in the Taxonomy of *Eucalyptus*", "A New Species of the *Acacia decurrens* Group from New South Wales", "The New South Wales Species of *Darwinia*", "Notes on *Lomandra* in New South Wales", "Taxonomic and Cytological Notes on *Acetosa* and *Acetosella* in Australia".

Meantime, material is accumulating for Vol. 3, No. 4. The papers in hand for it are: *"Restio tenuiculmis,* a New Species from Eastern Australia", *"Dryopoa,* a New Grass Genus Allied to *Poa"*, "Geographic Races in *Restio tetraphyllus* Labill", "Calendar of Flowering Times of Some Plants of the Sydney District, Possibly Associated with Pollinosis", and "The Bleeser Botanical Collection from Northern Australia".

A paper providing cytological and taxonomic notes on the Zamiaceae has been prepared, to supplement a previously published revision and the descriptive matter on the family in the *Flora of N.S.W.*, No. 1.

A paper entitled "Interspecific Hybridization in the *Ranunculus lappaceus* Group" has been accepted for publication in the journal of the American Society for the Study of Evolution.

Two papers on the Restionaceae, "A Revision of the *Restio gracilis* Complex" and "New Species in *Lepyrodia"*, are nearing completion.

A study has been made and a paper prepared on the generic and tribal relationships. the evolutionary patterns and the cytology, of the family Proteaceae.

A monograph on the genus *Lastreopsis* has been almost completed. A revision of the genus *Crepidomanes* in southeastern Australia has been completed; the species are small epiphytic ferns belonging to the family hymenophyllaceae. Material on the genus *Microgonium,* of the family hymeno phyllaceae has been prepared for the *Flora of N.S.W.* Work is in progress on the fern genus *Arachniodes.*

Work on the genus *Poa* continued. A field trip to coastal and subalpine districts in Tasmania provided a better understanding of the species present in this State.

Progress of revision of the Australian Juncaceae has been considerable. Anatomical investigation of the species has revealed useful supplements to the other characters of value in classification of the group.

Work on the genus *Xanthorrhoea* is in progress for the *Flora of N.S.W.* This difficult genus has not hitherto been adequately represented in herbaria, and the work of the official collector has very usefully supplemented the earlier collections. Following upon completion of the other Australian genus, *Lomandra,* of the family Xanthorrhoeaceae, about 1,000 specimens that were here on loan were named and returned to the respective institutions.

Cytological studies have been made on most of the species of the Restionaceae native to N.S.W. This has thrown light on a number of taxonomic problems in the group, and a diversity of chromosome numbers within the family has been demonstrated. The results are being incorporated in the treatment of the family and in research papers on *Restio* and *Lepyrodia.* Studies on *Acetosella* and genera of the Zamiaceae have contributed substantially to completed papers on these groups. Other chromosome number determinations have been made in association with taxonomic research on *Typhonium, Ranunculus* and *Xanthorrhoea.* A number of Pteridophyte species have been investigated, including *Gleichenia alpina, Lastreopsis smithiana, Cyclosorus nymphalis* and several members of the Hymenophyllaceae.

With the co-operation of the Waite Agricultural Research Institute, South Australia, a perennial weed of the family Compositae, spreading in the Maitland district in recent years (although first recorded there in 1906), has been identified as a South American species, *Wedelia glauca;* it is also naturalised on the coast of South Australia. The name *Wedelia glauca* was incorrectly applied to a western perennial weed in the 1930's. This western weed is now believed to be a species of *Helianthus* and steps are being taken to have this checked abroad.

Herbarium Visitors.—Among overseas visitors who worked at the Herbarium or discussed mutual problems were Dr. H. Bate-Smith, Director, Low Temperature Laboratories, Cambridge, England; Dr. R. Melville, Royal Botanic Gardens, Kew, England; Dr. J. Weathers, Guggenheim Fellow of the University of California; Dr. H. Sleumer, Rijkscherbarium, Leiden, Holland; Mrs. M. Pederson, Oslo, Norway; Dr. van Royen, late of the Rijkscherbarium, Leiden, en route to Botanic Gardens, Lae, New Guinea; Dr. P. Lubenetaz, and Dr. T. Zaroubaile, Russian Plant Breeding Research Institute,

Leningrad, and the four Colombo Plan Fellows Messrs. S. Sen and S. M. Dubey, of India, R. J. Kantaprawara, Indonesia, and S. M. Sen, Burma.

Scientific workers from Australian institutions included Dr. M. E. Phillips, Parks and Gardens, Section, Department of the Interior, Canberra; Mr. L. Pedley, Brisbane Herbarium; Dr. A. B. Cribb, Brisbane University; Dr. H. S. McKee and Mr. M. Gray, C.S.I.R.O., Canberra; Mr. J. Williams and Mr. J. Green, New England University.

M.B.E. to Dr. Joyce Vickery.—Dr. Joyce Vickery received the M.B.E. in the Queen's Birthday Honours list. Dr. Vickery has a world-wide reputation for studies on the taxonomy of Australian grasses and has achieved note in the general identification of plant material, notably in the Thorne kidnapping and murder case.

Radio Series.—The Australian Broadcasting Commission taped recordings of the Director and several members of the staff speaking on aspects of the history and work of the National Herbarium and Royal Botanic Gardens. This quarter-hour programme was presented over the National Stations on a number of occasions.

Colour Transparencies Donation.—Mr. Eric Gordon, a prominent amateur collector of native plants, has presented to the Herbarium over 3,000 colour transparencies of native flowers, and some cultivated species. Many of the slides are of great interest botanically. They picture flowers in several stages of dissection, showing the arrangement of essential parts.

Service in Committees.—The Director and members of the botanical staff served in several committees, including: the Remembrance Driveway Committee and its Special Planning Sub-Committee, which necessitated several inspections of the driveway plantations; the Horticultural Advisory Committee of the Department of Technical Education; the Muogamarra Trust; the Linnean Society of N.S.W.; and the recently formed Trust instituted to protect a stand of the very rare wattle, *Acacia pubescens,* near Bilpin on the Blue Mountains.

AGRICULTURAL RESEARCH INSTITUTE, WAGGA

Wheat Improvement

Erratic seasonal conditions were experienced. Poor autumn rain delayed seeding, and the dry hot weather of late spring resulted in premature ripening. This was reflected in pinched grain of low bushel weight (50-55 lb.) and extremely high protein (14 per cent to 18 per cent). Pre-harvest, heavy summer rain sprouted the grain in the ear.

At Moombooldool, heavy frost damage provided a chance to assess reactions of a number of crossbreds and varieties.

Performances of New Varieties.—The Institute's two new varieties Heron and Falcon did well throughout the southern wheat areas. Heron was also reported to have yielded well in Victoria and South Australia. Heron, Falcon and Olympic have set new standards of yield, and steps have been taken to delete a number of well known wheats such as Bencubbin, Kendee, Javelin 48 and Celebration from the list of varieties recommended in the southern New South Wales areas.

Breeding for Quality.—Basic studies on the granularity of wheat wholemeal continued, and the technique has been adopted as a routine test in the breeding programme. The action of a single major gene determining granularity in a cross between Heron and Falcon has been demonstrated.

The back-cross programme was continued through further stages. Yield and baking tests confirmed earlier opinions of Eureka x 2 Bencubbin material and enabled further selections to be made of Gabo x 3 Glenwari.

Breeding for Disease Resistance.—Two derivatives of Heron, possessing stem rust resistance from Eureka and Kenya Farmer respectively, yielded well in all trials and seed stocks have been increased for possible release. Resistance originally derived from *Agropyron* has also been incorporated in the Heron genotype.

Semi-dwarf Wheats.—Development of short strawed wheats for use in the higher rainfall and irrigated areas has progressed. Locally produced crossbreds and several introductions from Mexico yielded well. Trials will be continued.

Supplementary studies with gibberellin and (2-trichloroethyl) trimethyl ammonium chloride have been commenced. Differential varietal reactions to these chemicals have been demonstrated.

Frost Tolerance.—An important development towards production of frost tolerant wheats has been made through basic studies of phasic development. Clear evidence of monogenic inheritance of vernalization response in spring varieties has been secured. This is the first demonstration of its kind in wheat. It should find direct application in the production of new varieties adapted to southern New South Wales and in providing a useful means of minimizing frost damage in this State.

Wheat Disease Studies

Root and Foot Rot Diseases.—A review of the world literature on this subject has been completed and published as Science Bulletin No. 77. The publication was made possible through financial support from the Wheat Industry Research Council.

Powdery Mildew of Wheat.—A study has been made of a new naturally occurring race of *Erysiphe graminis tritici.* It is able to attack varieties carrying the Ml t gene for resistance to previous races.

Wheat Quality Investigations

Quality Testing Breeders' Material.—Routine quality testing facilities have been used at full capacity on wheat breeders' material in the short period between harvest and seeding.

Main means of evaluation has been the test bake. This has proved most reliable and effective. Confidence in the test has been strengthened progressively by analysis of accumulated results.

Assessment of milling characteristics is based on the known relationship between results obtained from experimental and commercial milling of the same grist. Commercial tests by four mills have supported the Institute's original view that the newly released variety Falcon behaves in a manner normal for hard wheats.

Physical Dough-Testing.—This has been continued by means of the Chopin Alveograph, alongside test-baking of crossbred material. Good correlations of protein content with dough strength and baking quality were obtainable for individual varieties, but no general interpretation of the results has given a reliable assessment of baking quality over a range of distinct types.

Nitrogen Metabolism Studies.—These wheat plant studies have been continued. Results indicate a progressive loss of nitrogen from the aerial parts of the plant following the "dough" stage, until the plant reaches maturity. By this time about 70 per cent of the nitrogen and 80 per cent of the phosphorus present are located in the grain.

Variety Classification on Diastatic Activity.—A large number of wheat varieties have been classified on the basis of their diastatic activity. A wide range was found. They varied from about 500 mgs. of maltose per 10 gms. down to 80 mgs. An examination of the six streams of flour from the Buhler laboratory mill was made, and the diastatic activity and protein content plotted graphically. Several graphical patterns were obtained, each characteristic of separate wheat "types".

Oat Improvement

New Variety—Cooba.—The crossbred M.1010 has been registered and released for general cultivation, under the name Cooba. Cooba is a dual purpose variety, and besides suitability for forage and grain production it has many good agronomic features. It is very early in maturity after grazing, has resistance to oat smuts and crown rust, and is acceptable for milling.

Varietal Grain Yield Trials.—During the season under review, data from the grain yield trials clearly showed the importance of shattering-resistance. Avon was superior to all other varieties; its shattering and lodging resistance contribute to the reliability of this variety under adverse conditions.

Weed Investigations

Skeleton Weed; Physiologic Studies.—Physiologic studies have confirmed the vernalization requirement for floral initiation. Stem and flower production were completely inhibited by continuous temperatures above 16°C. Vernalization treatment was not effective unless a minimum of ten rosette leaves had been formed.

The germination capacity of skeleton weed seeds reached a maximum four to five days before the seed was released. A decline in germination capacity followed, and a second maximum was reached six to nine months later.

Black Oat Control.—Di-allate, barban and four triazines significantly reduced black oat populations in wheat crops. There was no difference between them. Pre-emergence applications were superior to pre-sowing and post-emergence applications, except for barban. This gave better results from post-emergence applications.

Quaternary Ammonium Compounds in Pastures.—Diquat and paraquat have been used successfully as selective herbicides in pastures. At very low rates (1 to 6 oz. active cation), diquat controlled capeweed seedlings in young clover-rye grass pasture without undue damage to the pasture.

Barley grass seedlings were effectively removed by paraquat at 2 to 4 oz. active cation per acre. There was evidence of a concentration-volume interaction.

Soil Fertility

Agronomic Survey.—A survey was made of a 250 square mile area, involving 466 paddocks sown to wheat in 1961. Analyses of the yield and grain quality data have not yet been completed. Results so far support previous indications that introduction of clover ley can lift grain protein levels from about 10 per cent to about 12 per cent.

The survey is particularly relevant at present; it is providing valuable data for the N.S.W. Advisory Committee on Wheat Production and Marketing. The work is likely to provide a basis for wheat production and marketing policies in the future.

Nitrogen Nutrition of Wheat.—The response to varying levels of soil moisture during the season, involving the changing pattern of mineral nitrogen release and its uptake by the crop, was studied in the field in 1961. The results indicat that, under favourable seasonal conditions, changes in soil moisture had no direct effect on nitrogen release or uptake up to the flowering stage of the crop. There was, however, an expected benefit to the yield when stored or added moisture became available during the dry post-flowering stages of plant development. The depletion of soil mineral nitrogen to very low values in the soil at ear-emergence occurred again during 1961.

The effects of storage of soil samples on the levels of nitrate and ammonia nitrogen are still being studied. An assessment of the drying and storage treatments on the resultant incubation nitrogen values will follow this study.

Moisture Utilization Studies.—Significant increases in soil nitrogen levels following the widespread use of clover leys have been a feature of the post-war period. When ley-land is returned to crop, potential yields have not always been realised, since low soil moisture levels at flowering, associated with hot, dry finishes, have caused "haying off" with consequent reduced yields and pinched grain.

The relative importance of various factors which affect the efficiency of moisture use in wheat grain production are now being determined. Crop density was varied by altering sowing and seeding rates and fertiliser treatments.

The trials will be continued in a similar form in 1962, when new equipment will permit more accurate and detailed observations. A suction leaf-area planimeter will be used to measure crop leaf areas, and soil moisture changes will be followed with a neutron-scattering moisture meter.

Topdressing of Pastures.—Experiments to assess the potential carrying capacity of clover pastures in the southern wheat belt have been designed. Three stocking rates (2, 4, 6 dry ewes per acre) and four topdressing rates (0, 1, 2, 3 cwt. super. per acre per year) are to be used. Animal production will be assessed by six-weekly midside wool sampling, together with periodic live weight measurements. An examination will also be made of varying methods for assaying pasture oestrogens.

An estimate of the economics of topdressing will be obtained during the four-year pasture phase, as well as during the subsequent cropping phase, when residual effects will be measured.

Intensity of Cropping.—A long-term rotation trial has been designed to determine how intensively cropping can be carried out on improved soils without reducing the fertility levels. The experiment will be preceded by a uniformity trial in 1962.

DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS

State Marketing Bureau

Marketing Boards.—All Marketing Boards constituted under the provisions of the Marketing of Primary Products Act, 1927-1956, continued to function. Boards in operation comprise the Egg, Rice, Wine Grape, Navy Bean and French Bean Seed Boards. Winding-up of the affairs of the Potato Marketing Board (in liquidation) was concluded.

Amendments to Regulations.—Regulations under the provisions of the Marketing of Primary Products Act, 1927-1956, were amended in respect of sustenance allowances payable to Board members. Rates were increased in accordance with those provided under Public Service Board Regulations.

Regulations relating to the Egg Marketing Board were amended to provide for four grades of new laid or first quality eggs of the domesticated fowl other than ducks. This is instead of three grades.

Polls and Elections.—Several polls were held under the Marketing of Primary Products Act, 1927-1956, to provide for the election of producers' representatives. These were as follows:—

(*a*) Triennial Election of five producers' representatives to the Rice Marketing Board.

(*b*) Triennial Election of five producers' representatives to the Egg Marketing Board.

(*c*) As a result of the death of an elected member of the Rice Marketing Board, a by-election was taken to fill the vacancy for the unexpired term.

A petition from lemon growers has requested that lemons be declared a commodity under the provisions of the Marketing of Primary Products Act. Arrangements are in hand for a poll of lemon producers later in 1962, to determine whether a Lemon Marketing Board should be constituted.

Marketing Reports and Related Services.—As required under the provisions of the Marketing of Primary Products Act, 1927-1956, the Division fulfilled its statutory functions and continued to collect and disseminate detailed marketing information in respect of the operations of the various wholesale markets.

Specially trained marketing officers prepared reports covering supplies, quality, prices and price movements at the City Municipal Markets (fruit, vegetables, poultry, fish and cut flowers), Homebush (cattle, sheep and pigs), Alexandria, Perry's Park and Sussex Street (grain, forage and hard vegetables).

Information collated was broadcast daily by the Australian Broadcasting Commission, including regional relays and interstate hook-ups. Some commercial radio stations also utilised parts of the information. The daily press, periodicals, Federal and State Government Departments and instrumentalities, producer organisations, etc., were furnished with detailed marketing information per medium of the *Daily Wholesale Price Quotations.*

Retail price collection work was continued. Increased coverage was given to commodities and localities. Prices collections covered fruit, vegetables, meat (beef, mutton, lamb and pork) and fish.

The Division continued to prepare and distribute its *Weekly Marketing Notes.* These were widely circulated. They comprised detailed reports on the stock sales (sheep, cattle and pigs) at Homebush, prices and supplies of fruit, vegetables, cut flowers, forage, meat, fish, poultry, grain (local and overseas), miscellaneous farm produce and processed products. The notes also covered cold storage statistics in respect of butter, cheese and fruit; and they included a series of average monthly prices for a comprehensive range of farm products.

Monthly surveys covered the collection of stock feed prices on a wholesale and retail basis and wholesale prices of dressed poultry. Arrivals into Sydney, by rail and sea, of various primary products from interstate and intrastate sources were recorded.

Numerous requests were received from State and Federal Government Departments, foreign countries, banks and private individuals for information relating to prices and prospective markets for an extensive range of primary products.

Crop Reviews and Forecasts.—This service was continued. Forecasts of production were prepared in respect of wheat, oats, citrus fruit and broom millet. The regularly monthly survey of *New South Wales Pastoral Conditions* and the *Report on Production Trends* were also continued.

Meteorological Services.—A Divisional officer continued to act as the Departmental representative on the State Climatological Committee of New South Wales and as liaison officer between the Department and the Sydney Weather Bureau. Comprehensive meteorological records and data were maintained in the Division. Data were provided for officers of various Divisions and members of the public, particularly about rainfall as affecting various farm pursuits.

Economics Research

The Division's economics research programme has been expanded, helped by an improvement in the staff position. The full effect has not yet been reflected, but there will be a significant increase in research output in the coming year.

The main research projects completed or still in progress were as follow:—

Economics of Pasture Improvement.—The final data for this study were collected from farmers in the Mid-Western Region. Analysis of the information from field interviews is proceeding. Some interesting progress results have been obtained.

The project has clarified the nature of decisions involved in investment in pasture improvement. Further, it has thrown some light on the use of dynamic programming, a recently-developed research technique, in the study of agricultural allocation problems.

This project has already lead indirectly to three papers. One is "Some Applications of Dynamic Programming in Agricultural Economics", for the Statistical Society of New South Wales. Another is "Game Theory and a Time-of-Market Decision", published in the *Australian Journal of Agricultural Economics.* The other is "Some Notes on 'Dynamic' Linear Programming"; in press for the *Review of Marketing and Agricultural Economics.* There will be a further article relating to this project soon, for the *Review.*

Economics of Fertilizer Usage.—This project has now been completed, except for a final joint report with the co-operating research agronomist from the Division of Plant Industry.

The main results of this research project as far as this Division is concerned were published in an extensive article in the *Review of Marketing and Agricultural Economics.* The article was "Fitting Production Functions to Experimental Data". It contains material of interest to both research and extension workers; to research workers because it clarifies the mechanics of the production function approach to the analysis of experimental data; and to extension workers because it illustrates the way seemingly complicated experimental results can be of direct use in giving extension advice.

Economic Study of the North Coast Dairy Industry.—Considerable progress was made with this study. It is being financed by the Australian Dairy Produce Board under the terms of the Dairy Produce Research and Sales Promotion Act. The initial survey of a random sample of 60 farms has been completed. A comprehensive report on the survey has been published in the *Review of Marketing and Agricultural Economics.*

A statistical study is continuing. It is reviewing long-term farm adjustments in the area.

A number of other projects are being developed logically from the preliminary survey work. Among the most important of these is a study of the economic aspect of sprinkler irrigation on North Coast dairy farms. A pilot farm survey has been completed and preparations are being made for a full-scale field survey. This will yield useful information on the economics of supplementary irrigation in the dairying industry.

A long-term study has been undertaken in co-operation with the Division of Plant Industry, about the economics of commercial farm application of a system of improved pastures, fertilizer techniques and animal management evolved at Wollongbar Agricultural Research Station. Detailed case studies of three selected farms will be made, to investigate the economics of whole farm proposals evolved at the Research Station.

A further study in progress relates to the economics of herd improvement; estimates of production gain by the use of herd testing and artificial insemination are being used to evaluate the economic worth of these techniques. This work will be of considerable interest both to dairy farmers and to the Department's extension officers.

Farm Management Study, Nowra District.—Twenty dairy farmers have now been co-operating in this study for four years. Financial and production records have been analysed annually. The results have been published in roneoed form.

The annual summaries have been given to the participating farms, appropriate extension workers, and other interested persons. It should be possible to use the data for a more detailed study when the results for the fourth year (1961-62) are available.

The Pattern of Industry Assistant to Rural Research.—A project to survey the implications and effects of funds made available by primary producers for rural research has been continued. Scope of the study has been broadened to permit some analysis as to who might benefit from such research. Economic benefits, from technological advances resulting from research, favour different groups within the economy under different circumstances. Thus it is not clear who should pay for this research.

Attention is still being paid to the impact of these funds on research, particularly within new research units. These funds represent a large proportion of the total funds available to these units. Thus the criteria and mechanism used in the allocation of such funds appear to be having a considerable effect on the way research is being done. The project should be completed by the end of 1962.

Optimum Enterprise Combinations for Farms on the North-western Slopes of New South Wales.—The study aims to determine the optimum combination of enterprises and methods of production for typical farm situations in the North-west, and the changes in the optima that would be induced by changes in prices, costs and input-output relationships.

A random sample of 60 farmers producing wheat has been made, and using the survey method, information relating to the organization and management of each farm collected. Analysis of this data, supplemented by information from local extension officers, will enable average input-output relationships for the various enterprises to be formulated.

Application of the linear programming technique, using Silliac, will give optimum combinations for these enterprises for typical farm situations and for a range of prices, costs and input-output relationships.

This study should help to meet the criticisms, of some budget studies, that they are no longer useful in a changed economic environment and they are not very helpful to the non-average farmer who forms the bulk of the population.

Agricultural Significance of an Area Served by a Deep Sea Port in Iluka.—This study was initiated at the request of the Department of Public Works. It aimed to assist further consideration of development of a deep sea port at Iluka on the Clarence River, subject of a special committee of enquiry in 1946.

The study estimates the total quantities of the major primary products, from the hinterland of the port, likely to be available for shipment overseas and interstate now and in the "foreseeable" future. To a large extent, data has been obtained by collation of existing published or unpublished information on production, consumption, export, imports, movements by road and rail, etc. Estimates for the future have been based on a study of trends in production and consumption statistics, local knowledge of Departmental extension officers, and outlook statements for world trade made by official bodies. A report is now being compiled.

Establishment Problems in Farming.—This study, initiated in 1960, has not yet been completed. The research activity will be complete by the end of 1962.

It is concerned with the economic problems in establishment of farms, and is based on a large scale survey of settlers in various stages of development. The broad aim is to provide some information relating to the capital requirements of farming. Settlements developed under the War Service Land Settlement Scheme are being used as a basis for the study.

The information will be most useful in pointing out the factors important to the successful establishment of a farm. It should also be valuable in the formulation of management decisions of the co-operating farmers.

Economic Study of Coleambally Irrigation Settlement.—This study continued and is being extended to include properties settled during the second and third year of development. A total of about 50 farms, including up to six horticultural properties, will provide data. Records of the first year's operation have been collected from a number of original settlers. Data for their second season will be available shortly, as will the first complete season's records for the second group of properties settled.

The main objectives are to study capital accumulation and the associated costs of development, and to measure the range of incomes obtained. Subsidiary objectives include a study of the relationship between capital resources at commencement, and subsequent levels of income obtained; a study of the rate of development, in relation to capital resources at commencement; attention to the profitability of alternative farm enterprises; and a study of farm size.

Economics of Serrated Tussock Control.—Preliminary work has been commenced on a study of serrated tussock control and its economic aspects. The project is designed to fill in what at present appears to be one of the missing links in the problem of serrated tussock control.

Much is known about the agronomic and technical aspects of control. It is now appreciated that an economic evaluation of these methods is essential.

A number of case study farms are to be visited in the near future. Thus, some of the more specific aspects can be examined, and an appreciation of the practical farm problems may be obtained. These aspects could then be considered, along with the other more general economic considerations.

The results of the investigations should be useful to extension officers and farmers, and to financial institutions concerned with making loans for the purpose.

While the entire project will not be a short one, some useful results should be available before the end of 1962.

Economics of Cotton Production under Irrigation.—This study was commenced in June, 1962. It is to examine the profitability of cotton growing under irrigation, since this crop may prove a feasible enterprise on mixed farms in the Coleambally Irrigation Area and in other southern irrigation regions as well as in the northern part of the State. The study involves surveys of several farms growing cotton in southern N.S.W. Results may be available during 1962-63.

Production and Marketing of Honey in New South Wales.—A study of the production and marketing of honey is proceeding. The first part of the work comprises collection of comparative statistics on production and export of honey and beeswax from all States of the Commonwealth; research on the dispersement of, and reasons for, beekeepers' headquarters; and preparations for a management study. This part is almost complete. Results should be published early in 1963.

The second part will investigate the costs and returns on a management analysis basis, associated with beekeeping. Sociological conditions in the industry will also be studied.

Then the marketing of honey will be considered and it is hoped that attention can be given to consumer attitudes.

The completed study should provide valuable information for an industry that is having a hard struggle against falling prices and difficult marketing conditions.

Advisory, Educational and Extension Activities

Farm Management Extension Services.—A most important development has been the establishment of farm management extension services in two of the Department's extension regions. This service in farm management extension is to be integrated with existing technical extension services. It will eventually be expanded to cover the whole of the State.

Initially, appointments of trained agricultural economists have been made to regional headquarters at Tamworth, to cover the Northern and North-Western Regions, and at Wagga, to cover the Southern and South-Western Regions. Later, appointments will be made to other regional headquarters.

Economists so appointed will do research to obtain the necessary input/output data for use in farm management extension work and for advice to technical extension officers on farm management problems. They will do a limited amount of direct farmer extension. Of necessity this latter aspect of their work will be very limited.

It is anticipated that appointment of trained Economics Research Officers to all Regions will eventually result in a comprehensive farm management advisory service for farmers who wish to use it. The service will help to improve efficiency in the rural industries and to lower production costs.

Policy Advice.—The Division continued to provide advice on economic policy affecting agriculture. It also continued to examine and advise on the position concerning import and export of coarse grains, protein concentrates, and other farm requisites.

The Quarterly Journal.—Publication of the Division's quarterly journal the *Review of Marketing and Agricultural Economics* continued, at a high standard. Papers from agricultural economists employed in other organizations are accepted for publication in this journal. In particular, the Faculty of Agricultural Economics, University of New England, has submitted papers.

Lectures at Extension Schools.—Besides organizing in-service training schools in farm management for extension staff, officers of the Division addressed numerous extension schools organised by the Department and by the Agricultural Bureau and lectured at meetings and conferences organised by other farm organisations and the Universities. They also addressed various professional societies and other organisations, on economic aspects of the rural industries.

Lecture Courses at Agricultural Colleges.—The appointment of an Economics Research Officer to Wagga enabled a change in arrangements for lectures in agricultural economics at Wagga Agricultural College. Previously these were given on a visitor basis by officers of this Division. The arrangement now is that the Economics Research Officer located at Wagga does the lecturing in agricultural economics at Wagga Agricultural College. This will permit an expanded and improved College course in agricultural economics and farm management.

The Division still assists the Lecturer in Economics at Hawkesbury Agricultural College and examines in agricultural economics at each of the two colleges.

Representation in Committees

The Division continued to provide the Executive Officer of the State FAO Committee. In addition Divisional officers acted as Departmental representative in the State Nutrition Committee, the Markets Advisory Committee, the State Mapping Committee, and the Economics and Land Use Committees of the Hunter Valley Research Foundation. An officer of the Division was also in the Joint Planning Committee of the Regional and Extension Study, and in the intro-Departmental Committee on superphosphate usage.

DIVISION OF INFORMATION SERVICES

Editing Services

Periodicals.—Fifty-two issues of the weekly *Press Copy* (circ. 1,170), twelve issues of the monthly *Agricultural Gazette* (circ. 36,250), twelve issues of the monthly *Poultry Notes* (circ. 5,810), and six issues of the two-monthly *Dairy Topics* (circ. 17,500) were produced. Timeliness suffered, in keeping with staff shortages.

Press Releases.—The 52 issues of Press Copy carried 520 articles and 41 blocks. There were 80 loans of stereos to newspapers, as a result of the blocks in *Press Copy*. Roneoed press releases supplementary to the printed *Press Copy*, totalled 42 compared with 41 in 1960-61.

Miscellaneous Publications.—One hundred and eighty-nine other publications were sent to the printer after editorial work, 43 less than 1960-61. The printery returned 314 completed jobs, 101 more than in 1960-61. At the close of this twelve months' period there were 94 jobs at the printery, and the editing section had 60 jobs in hand for editorial attention.

"Pastures" and "Weeds" Textbooks.—Amongst special jobs sent to the printery this year was the edited typescript (about 1,000 foolscap pages) for the "Pastures" textbook financed by Commonwealth Extension Services Grant funds.

The "Weeds" textbook is under revision, as a Plant Industry Division commitment, for a 2nd Edition. An order is with the Printer for 1,500 extra copies of the 1st Edition, to bridge the period of waiting on the 2nd Edition.

The first printing (5,000 copies) of the 1st Edition of the "Weeds" book (42s.) has been disposed of. Sales commenced in December, 1959. Revenue has been in the vicinity of £8,500, including approximately £1,830 in 1961-62. It is credited to the New South Wales share of the Commonwealth Extension Services Grant.

Colour-plate Insect Pest Leaflets.—Fifteen more have been delivered by the printery, bringing the total to 37. The series of 38 will have been completed shortly.

"Author's Guide" for Agricultural Gazette Contributors.—A guide for authors, with application to the *Agricultural Gazette* in particular but Departmental publications in general, has been prepared. When delivered by the printery it will be distributed to all scientific and technical officers of the Department likely at any time to engage in writing for publications.

Advertisement Space Sales.—Gross income from space sold in Departmental publications was almost £14,000—about £13,600 for space in the *Agricultural Gazette* and £320 for space in miscellaneous publications.

Discontinuance of Advertisement Space.—In June, 1962, a major policy decision on advertisement space sales was approved by the Minister for Agriculture. In consequence, there will be no further space sales for publications other than the *Gazette;* and for the *Gazette* there will be no further space sales for issues later than that of December, 1962. Space already contracted for in issues after that of December, 1962, will be honoured. Advertising in the *Gazette* is expected to be finished by August, 1963, issue. As from January, 1963, issue the *Gazette* will comprise 64 in lieu of 96 pages. When all advertisement contracts have expired there will be 8-10 more pages for editorial matter than in the past.

Publications Distribution and Enquiry Section

Enquiry Statistics.—Excluding the Home Gardens Enquiry Officer's work (see later) the Section handled 36,436 requests for information (20,788 postal, 4,237 'phoned, and 11,411 in-person enquiries). The total was less than half that of the previous year; in part because the section was closed to the public for five months, July to November, for structural alterations. The telephone system was also affected for the period.

From January, 1962, the postal enquiries have been segragated as "country" and "metropolitan/urban". Of the 8,372 postal enquiries in these six months, 3,348 were from rural addresses and 5,024 from metropolitan/urban addresses. Rural addressees' letters, after they are serviced, are now redirected to the Regional/District offices of the Department for any follow-up action the country officers may see fit to take. The respective rural enquirer is also told, in the initial head office service, of the Regional/District offices and steered towards the latter for future contacts.

Home Gardens Enquiry Officer.—The H.G.E.O. handled 6,455 requests (1,265 postal, 3,142 'phoned, and 2,048 in-person enquiries) needing more specific attention than the literature-assisted service by office-assistants in the Enquiry Section.

Publications' Distribution.—In response to the public, and in requested bulk supplies to country offices of the Department, the Section distributed 677,667 publications compared with 791,604 in 1960-61.

An interesting feature was that, whereas only 274,425 of the 791,604 in 1960-61 were sent to country offices of the Department, in 1961-62 a total 458,473 items was despatched to country offices whilst 219,194 went directly to the public. Awareness of the Department's decentralised offices and services has increased.

Publications' Sales.—Only about 1.5 per cent of the titles in the Department's literature range represent saleable items. The major one is the "Weeds" book (42s.). Sales of this totalled 934 (excluding 86 drawn by the Government Printer for his sales section) and the revenue from the 934 was £1,827. Stocks were exhausted, or "Weeds" book sales would have been greater. Other saleable publications yielded £982.

Library Services

Accession Statistics.—The accessions total (796 books, 12,675 issues of periodicals, 4,112 pamphlets, and 741 annuals) was 18,324 compared with 18,295 in 1960-61. Of the 4,112 pamphlets, 3,268 were in series, 343 were catalogued, and 501 were arranged by subject. Of the 741 annuals, 31 were bound volumes, and 710 were unbound. Also, 286 volumes of unbound periodicals were tied preparatory to binding.

Of the 796 books accessioned, 156 were bought with Commonwealth Extension Services Grant funds for location at country offices. There are now 1,639 books from this source, at 73 locations.

The 796 books also included 53 for Wagga Agricultural College and 201 for Hawkesbury Agricultural College, bought with Library Trust funds derived from student contributions organised by the Colleges.

Central Library Loans.—These totalled 33,724 items compared with 31,923 in 1960-61 and 28,294 in 1959-60. The 33,724 comprised 26,967 periodicals on circulation (an average of 513 per week) and 6,760 others (average 130 per week). Of the 6,760: 5,212 were to officers of the Department from Departmental collections, 1,381 were to other libraries, and 167 were from other libraries to Departmental officers. In the two-way co-operation with other libraries, preponderantly more was loaned by the Department to other libraries.

"Library Information Bulletins".—These have taken the place of the former "Select List of Library Accessions." They comprise the latter plus additional library advice. Ten issues were compiled and distributed to Departmental officers. They totalled 154 foolscap pages, and listed 2,077 classified items.

Reference Work and Literature Searches.—The library staff continued these services for Departmental officers, external organisations, and the public. Results of each search were carded and filed, for access in the event of related future calls.

Photo-copying Service.—Jobs totalled 383 (480 in 1960-61) comprising 3,698 sheets (4,389 in 1960-61). The help of Public Works Department for multiple and large orders was drawn upon more often than in the past.

Assistance for Branch Libraries.—Librarian assistance was given part-time to the branch libraries in Divisions of Dairying, Horticulture, and Marketing and Agricultural Economics. Full-time librarian staffing continued at Hawkesbury Agricultural College, the Division of Science Services at Rydalmere, the Royal Botanic Gardens and National Herbarium, and the Animal Industry Division and Glenfield Veterinary Research Station branch libraries.

Library holdings and facilities were examined at Wollongbar Agricultural Research Station, Alstonville Tropical Fruit Research Station, Wagga Agricultural College, the Agricultural Research Institute at Wagga, and Grafton Experiment Farm. There are not enough librarians to cope with these needs at all of the country institutions.

Display Art/Designing Services

Show Exhibits.—The Section assisted country officers' exhibit efforts for eleven Shows. The Section's major effort comprised the Department's display, information bureau, and theatrette at the Royal Easter Show, Sydney. Designs and other work were done for exhibits associated with the approaching World Poultry Science Congress (Sydney, August, 1962).

Lecture Aids.—Art-work and signwriting were done for lecture aids series required by District Veterinary Officers, the Women's Extension Service, Agricultural Bureau Organisers, Dairy Officers, Sheep and Wool Officers, Poultry Officers, Beef Cattle Officers, Fruit Officers, Science Service Officers, Experiment Farms, and others.

Aid to Editing Section.—Art work, lettering, and lay-out for publications' covers were done for the Editing Section as required.

Photographic Aids Services, Cine and Still

Field Officers' 35-mm. Photography.—This yielded 8,800 colour and 5,040 black and white transparencies; all passed through the Photographic Aids Section. Respective totals in 1960-61 were 9,040 and 6,270. More than 1,000 prints were made from field officers' negatives. Fifty-five enlargements and transparencies, 15 in. x 12 in. or larger, were prepared for Show displays.

From the Photographic Library.—A total of 360 diapositives were prepared for rural television uses in Mid-Western Region and 190 diapositives were prepared as aids for Agricultural College lecturers.

Basement Storage Areas Converted

As a staff amenity, a modern cafeteria and social area have been opened in the Farrer Place basement formerly used for records storage. A quality conference-room and theatrette, and radio/film production/display designing studios (Division of Information Service activities) have been opened in adjacent, recovered basement areas.

Special Photographic Assignments.—These included: at the City Markets, a black and white series of thirty-six on fruit-packing methods and containers; a slide series in black and white, and in colour, from wheat publications; a colour slide series, off art-work originals, to supplement the cine film "Winter Pastures for Profit"; a poultry industry series in black and white, and in colour, for Department of Primary Industry dispatch to British Columbia; a series on weeds grown under control at the Royal Botanic Gardens; a transparency series for the Royal Agricultural Society's wheat industry display at the Easter Show; photos of senior administrators for a television channel's use; and others.

Cine Film Scripted.—A proposed cine film on "Seed Certification Schemes" was scripted, for production by the Department of Interior Film Unit on behalf of the Department of Primary Industry and for State use in extension service.

Cine Film Library

Increased Loans.—The Department's cine film library service met a surprising increase in film loans: 884 programmes collated, and 1,913 films loaned therein, compared to 521 programmes, 1,151 films, in 1959-60, and 627 programmes, 1,298 films in 1960-61. Near to 2,000,000 feet of film was checked and repaired where needed in the course of dispatches and returns.

Additional Films.—Eleven new prints, six new titles, were added to the cine film library, viz.: "T.B. in Cattle", four prints, produced by this Department; "Biological Control of Insects", a new print, "Unending Search", a new print, "Making of the Soil", "Farm Safety", and "Blue Mould of Tobacco", all supplied by Department of Primary Industry; "Flock Testing", supplied by the Australian Wool Bureau; and "The Story of Water Harvesting", supplied by the N.S.W. Milk Board.

Radio in Extension Service

Forty-two Rural Radio Stations Involved.—With three exceptions, all rural stations in New South Wales now make regular use of farm programmes. Some stations have several farm sessions per week, involving Department of Agriculture officers or material.

Not less than 4,500 broadcasts were provided by the Department's officers in the past twelve months.

Recordings from Head Office.—In keeping with the policy of "local material, from local stations, by local officers", only fifty-six recordings were made at Head Office for general release. Thirty-six of these were Women's Extension Service recordings.

Decentralised Recording Facilities.—Advice has been given on soundproofing and associated treatment of a room for recording at Wagga, Gunnedah, Tamworth, Maitland, and Cowra offices.

Fourteen more tape recorders of broadcast quality and thirty high quality, low impedance microphones were acquired for country offices. Two transistorised, battery-operated tape recorders also were acquired, for trial schemes.

Preparations for Rural Television

The audio/visual aids officers, photographic and radio, have been laying a foundation for Departmental use of rural television channels.

They planned and supervised the construction of studio facilities in the basement, and have acquired considerable equipment for the new studio suite and for field use. The Section will produce film footages, film clips, slide series, etc., to help field officers meet demands likely to be made on them by rural television channels.

Tutorial sessions on television as an extension aid were included for field officers in the 1962 in-service school on Extension Service/Extension Methods, with the help of the North Sydney Technical College School of Electronics.

The Agricultural Bureau ("Extension Groups")

Two major changes occurred. One was the adoption of new boundaries, to coincide with the Department's Agricultural Regions, with two Bureau Divisions in each Region. The other was the change of State Congress period to a week in May; after almost forty years of being held in July.

New Boundaries.—Intense efforts were made to capitalise on the boundary changes, by creation of vigorous Divisional and Regional Councils within the new boundaries, and to meet varied problems arising from the changes.

Altered State Congress Period.—The change in State Congress period had an additional, unsettling effect. Two Annual State Congresses were held within ten months, one in July, 1961, attended by 250 delegates from 100 branches, and one in May, 1962, attended by about 150, from 59 branches. In the new three-terms/three-vacations system at the College, the Bureau had a choice of May or August for the Congress. May was taken. Inevitably, this adversely affects attendances from the wheat-growing areas. On the other hand, August has disadvantages for coastal producers, or for mixed farms inland affected by lambing seasons.

Regional or Divisional Conventions.—Eight such Conventions were held. Attendances ranged from 100 to 200. Some of the Conventions were excellent in terms of programme, standard of local organising effort, and attendance. Others were not satisfactory. The Advisory Council and Regional Councils are re-examining their ideas on types of programme and organisational effort likely to make for success of the decentralised Conventions.

Leadership Training Schools.—Seven Leadership Training Schools of from three to seven days' duration, and one leadership training course comprising a night per week for five weeks, were conducted by the Agricultural Bureau, and one Junior Farmer Club leadership school was assisted.

Technical, Subject-matter Schools and Courses.—Seven schools were conducted by the Agricultural Bureau: "Sheep Husbandry", at Coonabarabran (34 attended); "Tractor Maintenance", at Wallabadah (15); "Irrigation", at Muswellbrook (34), and Lake Cargelligo (42); "Beef Cattle", at Muswellbrook (50) and Molong (38); and "Shearing", at Wallabadah (15).

Nine courses, of one night a week for five or six weeks, were conducted by the Agricultural Bureau: "Soils and Botany", at Coff's Harbour, Glenorie, Mangrove Mountain, Mudgee, Trundle, Dorrigo, and Mary's Mount; "Farm Management", at Arcadia; and "Dairy Cattle Health", at Wyong.

Four schools and two courses for women were also conducted by the Agricultural Bureau. There is further mention of these under the heading "Women's Extension Service".

The Agricultural Bureau Councils, Branches, and Organising Staff were key elements in twenty-seven short-term schools and courses for farm people in the past year.

Branch Activities.—Activities of Agricultural Bureau branches, at their ten to twelve meetings per year per branch, have continued to reflect, in their variety, differences in branch size, agricultural pursuits, community attitudes, and intensity of desire for information. Current trends are towards more detailed subject-matter, more discussion at meetings, more specialisation at field days and full day meetings.

New Branches, and Branch Numbers.—The net gain in active branches was seven; seven new branches were formed, two were reformed and activated, and two disbanded. One hundred and seventy branches affiliated financially with the State Council of the Bureau. Nine associate groups also affiliated—seven M.I.A. Extension Groups and two women's groups.

Women's Extension Service

The three Extension Officers in this Service assisted rural women and farm homes through the Agricultural Bureau, the Country Women's Association and Younger Sets, the Junior Farmer Clubs, the Girls' Life Brigade, farmer industry associations, and through mass as well as group channels.

Women's Sessions at Major Gatherings.—Women's programmes were arranged for two State Congresses of the Agricultural Bureau (July, 1961, and May, 1962), eight Regional Conventions, eight Regional Field Days of the Agricultural Bureau, and three combined Field Days of the Farmers and Settlers' Association and the Department. Twenty-three sessions at these gatherings were contributed by the women extension officers, and 50 were contributed by other guest speakers and demonstrators.

Visits to Bureau Branches and Councils.—Nine itineraries of visits to Agricultural Bureau branch meetings were completed by the women officers. These itineraries yielded 37 branch meetings. Eleven other Bureau branch meetings were visited for talks or demonstrations.

Eight meetings of newly constituted Regional/Divisional Councils of the Agriculturai Bureau, arising from the new boundaries, were attended. The aim was to encourage promotion of women's interests in branch and regional programmes, including more short schools/courses for women.

Short Schools and Courses.—Tutorial help was given by the women officers at six leadership schools of the Agricultural Bureau, and two extension service/methods schools.

The women's service also conducted four schools and two courses in aspects of home-making: A "Food & Human Nutrition" Course, Coff's Harbour; a "Dressmaking" course, Wyong; a "Dressmaking" school, Cowra; a "Management" school, Nelson's Bay; a "Floral Arrangement" school, Lake Cargelligo; and a "Textile" school, Holbrook.

Mass Channels of Communication.—Forty-six of the 52 issues of this Department's weekly *Press Copy* carried women's interest items. Thirty-six recordings were taped at head office for rural radio stations' use in sessions for rural women; tapes were made also at Regional offices during rural itineraries; and the A.B.C. Country Hour was assisted in-person on seven occasions. One television appearance was made.

Short-term Schools and Courses, in General

The Extension Officer (Short-term Schools/Courses Organiser) was able to assist more than half the total of 71 schools and courses the Department and/or the Agricultural Bureau was responsible for this year. He assisted by publicity, information notices, enrolment forms, participation in programme drafting, collation of lecturers' papers and handbooks, and, in a few cases, by residential supervision of the particular project.

Of the 71 short-term schools or courses, seven were in-service training schools promoted by various Divisions of the Department, 53 were schools for farmers, and 11 were courses for farmers (one night per week for five or six weeks). The 27 schools and courses mentioned in the Agricultural Bureau section of this report are in that total of seventy-one.

The total of 71 schools and courses was twice as many as in 1960-61 and reflected increasing demand for this type of extension work. A feature of the trend has been demand for schools at local centres as against those at the Agricultural Colleges or Yanco Agricultural Research Station.

Other Government Departments, and the C.S.I.R.O., the Universities, Banks, commercial firms, etc., have co-operated with the Department in providing lecturers for the schools and courses. Even so, great difficulty has been experienced in staffing the undertakings or in keeping to a total wherein quality has not been sacrificed to quantity.

Extension Service/Methods Training and Examinations

The Division of Information Services conducted an 11 days in-service school, residential, for 40 officers of the various Divisions and the Agricultural Colleges. Junior Farmer Club Supervisors, Department of Education, were also included. Fifteen field officers, candidates for higher-salary grades were subsequently examined as required under Public Service Board Regulation 124. All were successful in the examination.

Two extension service/methods schools, six days residential, were conducted also for University undergraduates: a school for University of Sydney Agriculture II students, and a school for University of New England Rural Science II and Agriculture Economics II students.

REGIONAL EXTENSION SERVICES

Personnel in the Nine Regions

Numbers.—There are 333 extension and regulatory officers stationed in country districts, 292 of them in the Regional Extension Services, within the nine Agricultural Regions.

Two New Categories; Economics and Machinery.—In 1961-62 some important new types of appointment to Regions were made.

Economics Research Officers were appointed to the Southern (Wagga), and Northern (Tamworth) Regions. The two Regional agricultural economists are the first in a programme that provides for one at the headquarters of each of the nine Regions. In the early stages, the agricultural economists will be largely concerned in obtaining data for use by extension officers and others in business advice to farmers.

Two Agricultural Machinery Officers were appointed; one to Western Region (Orange), and one to South Western Region (Leeton). One also is programmed for appointment to Southern Region (Wagga). These officers will advise on use and operation of agricultural machinery.

More Beef Cattle Officers.—Beef production is gaining importance on the north coast, so a beef cattle advisory officer has been appointed to the North Coast Region, with headquarters at Lismore. A beef cattle advisory officer has been appointed also to the Southern Region with headquarters at Wagga.

Dairy Officer to Deniliquin.—Dairy production has expanded in Finley and Deniliquin districts of South Western Region to such an extent that a Livestock Officer (Dairy Cattle) has now been appointed with headquarters at Deniliquin.

Overseas Visit by Chief

Mr. John L. Green, Regional Extension Services Chief, visited the United Kingdom and Europe in 1961. He attended a seminar on agricultural advisory work at Wageningen, The Netherlands, with 133 others from 41 countries, and has reported observations made on agricultural advisory services in the United Kingdom, France, West Germany, and The Netherlands.

Regional Advisory Committees

Regional Advisory Committees (the Regional Supervisor as Chairman, with six primary producers and one prominent townsman as members) continued to meet at the rate of two or three times a year. The Committeemen are Ministerial appointees, to advise and make recommendations to him on agriculture in the Regions.

Conference of Regional Supervisors

A three days' Conference of Regional Supervisors was held in Sydney, February, 1962, attended at various times by most of the senior personnel of the Department to discuss matters with Regional Supervisors.

Field Personnel in Country Districts, under Regional Supervisors—1st July, 1962

Types of Officer	In Rural Areas		In Regions									
	Total	Not in Regions	Total	Southern	North Coast	Western	South Coast and Tablelands	South-Western	Northern	Mid Coast and Hunter	Mid-Western	North Western
Regional Supervisor	9	..	9	1	1	1	1	1	1	1	1	1
Agronomist (Extension)	38	1	37	4	4	4	4	8	4	3	3	3
Agronomist (Research)	3	1	2	..	..	..	..	..	..	2	..	..
Livestock Officer (Sheep & Wool)	18	3	15	2	..	2	2	2	2	..	3	2
Livestock Officer (Pigs)	6	..	6	1	2	1	..	..	1	1	..	..
Livestock Officer (Poultry)	3	1	2	1	..	..	..	..	1	..	..	..
Livestock Officer (Beef)	5	..	5	1	1	1	1	..	..	..	..	1
Livestock Officer (Bees)	3	..	3	1	..	1	..	..	1	..	..	..
Dairy Officer (Extension)	31	1	30	3	12	1	4	2	1	7	..	..
Dairy Officer (Livestock)	2	..	2	..	1	..	..	1	..	..	..	..
Fruit Officer	18	7	11	1	3	1	..	4	1	..	1	..
Machinery Officer	2	..	2	..	..	1	..	1	..	..	..	..
Entomologist	2	..	2	..	1	1	..	..	..	..	..	..
Pathologist	1	..	1	..	1	..	..	..	..	..	..	..
Economist	2	..	2	1	..	..	..	..	1	..	..	..
Publicity Officer	9	..	9	1	1	1	1	1	1	1	1	1
Italian Liaison Officer	1	..	1	..	..	..	..	1	..	..	..	..
Survey Officer (Milking Machines)	5	1	4	1	2	..	..	..	..	1	..	..
Seed Certification Officer	6	..	6	2	..	..	2	..	1	1	..	..
Demonstrator (Farm Machinery)	1	..	1	..	..	..	..	..	1	..	..	..
Fruit Inspector	39	13	26	3	9	3	1	6	2	1	1	..
Herd Organiser	8	1	7	1	3	..	1	..	..	2	..	..
Field Assistant (D.I.E.G.)	6	..	6	..	3	..	2	..	..	1	..	..
Field Assistant (D. of A.)	11	2	9	1	1	1	..	4	..	2	..	..
Field Assistant (A.E.G.)	20	1	19	2	1	3	2	3	3	1	2	2
Herd Recorder	84	9	75	6	24	1	15	6	1	22	..	..
Total	333	41	292	33	70	23	36	40	22	46	12	10

Office Accommodation in Regions

There are 48 offices in the nine Regions. Improvements have continued. There are now very few unsatisfactory or overcrowded cases.

Taree.—This has been poorly located and too crowded but a modern two-storey office block for the New South Wales Milk Board is under construction and will be ready by November, 1962. The Department of Agriculture will have the entire ground floor. Excellent accommodation includes laboratory, amenities room, store rooms, and garages.

Young.—The Public Service Board has acquired and renovated a building, and the Department of Agriculture is one of five Departments now in it. It is one of the best country offices of the Government.

Lismore.—This greatly overcrowded Regional headquarters office was relieved in May, 1962. Four rooms, previously Department of Lands, were made available. Senior staff now each have a room, and an inter-office telephone system operates throughout the building.

Leeton.—This Regional headquarters accommodation was one of the worst, but an approximate £15,000 expenditure has converted it into a modern and satisfactory office building, with facilities appropriate to Leeton's climate. An amenities room, laboratory, radio recording room, library, and garages have been provided.

In Other Country Towns.—At Coff's Harbour, Government offices are being built and the Department will move in early in 1963. At Grafton, the Copmanhurst Shire has built new chambers and Department of Agriculture officers will move in about September. At Moree, officers have moved from a single room in the Courthouse building to modern renovated offices, in a building shared with two other Government Departments. At Parkes, Cowra, Murwillumbah, Armidale, Glen Innes, Inverell, Coonabarabran, Goulburn, Cootamundra, Finley, and Bathurst renovations are being done or arrangements have been made to transfer or to acquire additional space.

Farmer Schools, Field Days and Conventions

Many of these extension gatherings have been arranged by regional officers in association with farmefs' organisations. One of the main associations has been the Agricultural Bureau of New South Wales.

Hay district has long been a difficult area for group extension. This year, the South-Western Regional officers in collaboration with branches of the Graziers Association held an outstanding Sheep and Pasture Convention at Hay. Throughout the three days there were sessions on stock, pastures, and crops, and there was an attendance of over 100 persons, many of whom travelled a great distance.

Each year the Southern Region conducts a number of farmer schools, of two or three days' duration. This year six were conducted, mainly on pastures and animal husbandry matters. One school, at Holbrook, was for ladies, and 50 attended. Total attendance at the six schools was 358 persons. The Southern Region has programmed to hold at least four large schools each year, and already three are in hand for 1963. A similar account could be given by each of the Regions. (The Division of Information Services Report records that 71 schools or courses were conducted this year.)

Schools for beekeepers took place this year. Extending over four days, they were held at Albury, Goulburn, and Lismore, with attendances of up to 70 beekeepers.

Extension officers in all Regions continued to make field days a prominent feature of their work. As an example, 59 field days were held in the Mid-Western Region, with 2,817 as the aggregate attendance.

Co-operation with Other Departments and Authorities

The Co-ordinated Extension Services Scheme.—Towards making full use of officers in the Public Service who are in rural areas and have agricultural training, the Co-ordinated Extension Services scheme came into operation a few years ago. In this scheme, extension officers of the Department of Agriculture, Soil Conservation Service officers, valuers of the Rural Bank, and New South Wales Milk Board field officers are co-ordinated, through local panels for advice to primary producers. Department of Agriculture officers make available to personnel of the other organisations, the Department's publications and details of pasture, crop, stock, and other recommendations. Thus, all are informed of developments and each is able to advise competently.

Activities of Flood and Bush Fire Relief Committee.—The Regional Extension Services Chief, and the Accountant, are in the State Flood and Bush Fire Relief Committee. Since the Hawkesbury river flood in November, 1961, 70 meetings have been held and 960 claims for relief and assistance due to flood damages and losses were submitted by householders and primary producers. In the vicinity of £100,000 was allocated. Of the claims, 480 were from farmers.

Help to Water Conservation and Irrigation Commission.—This year, further Coleambally Irrigation Area blocks were made available to settlers. The total of blocks settled in the last year, or for which applications have closed, is 98. In addition, 47 irrigation farms have been settled on "Kooba", in the M.I.A. In due course there will be some 900 irrigation farms at Coleambally.

Assistance in planning these new irrigation farms, and advice to settlers, have taken up a lot of the time of extension officers at Griffith and Leeton. W.C. and I.C. appreciation has been shown in naming a road at Coleambally as Wallin Avenue, after the Griffith District agronomist.

P.M.G. Department and Electricity Commission.—Erection of high powered transmission lines by the Electricity Commission and co-axial cables by the Postmaster-General's Department in country areas, has led to many compensation claims by primary producers. Most of these claims are referred to the Department of Agriculture, and field officers have inspected them to make compensation recommendations.

Forestry Commission.—Officers in the Orange and Bathurst districts have collaborated with Forestry Commission personnel in a survey of several thousands of acres of land infested with Serrated Tussock. The land has been offered by landholders for resumption for forestry, or for control of the weed by pasture improvement. Before a decision, a detailed survey of all areas submitted has been necessary.

Premier's Department.—Most Regional Supervisors, and many country extension officers, have been active as members of Regional Development Committees set up by the Division of Industrial Development and Decentralisation of the Premier's Department. Three Supervisors are in fact Chairmen of the respective Regional Development Committee.

Education Departments.—The Junior Farmer movement has been helped by attendance of officers at field days and meetings to give lectures and demonstrations. Field officers are also acting as lecturers in technical education courses conducted in country towns.

Local Government Authorities.—Advice and assistance have been given to Local Government Authorities concerning weed control.

Regional Publicity

In each Region there is a publicity officer, to help prepare material for use in the press, over the radio, and for television. Ten years ago agricultural press and radio activities of field officers were negligible. Today, articles by field officers are regular and frequent in most rural country newspapers, and the officers have firm commitments for radio broadcasts over 42 rural radio stations.

Each region has several high-quality tape recorders, each officer has ready access to a camera, and there are duplicating machines at the regional headquarters.

The Regional publicity officer works on publicity statements based on material supplied by the extension officers, for distribution to newspapers and radio stations.

A side-effect of regional publicity is that boundaries of agricultural regions as defined by the Department of Agriculture, are being accepted by other bodies for various purposes. The Agricultural Bureau of New South Wales has now segregated its Branches into Regions using Regional boundaries that coincide with the Department of Agriculture Regions. A book prepared by the Premier's Department for circulation overseas includes an official map of the State showing Regions as they operate in agricultural extension. A recent important decision by the New South Wales Wheat Advisory Committee is that wheat variety recommendations, instead of being based on loosely named and ill-defined areas, shall in future be on the basis of this Department's Regions.

Rural Television.—This year, television channels commenced operation at Orange, Lismore, Canberra, Newcastle and Wollongong. Further channels will commence in other rural centres in the next twelve months.

Plans are well in hand to make maximal use of television as a modern extension medium. Conferences have been held between rural television station managers and Department of Agriculture Regional staff. To facilitate decisions, Regional Supervisors have received authority to arrange direct with the television station management all matters pertaining to regional officers' participation in sponsored or unsponsored programmes.

Radio Broadcasts.—Officers of the Department have regular radio commitments on at least 42 country radio stations. Many of the talks are in sponsored sessions, but some radio stations so value the material and its reception that they are put on at special good-listening times, and not as sponsored sessions.

The number of broadcasts and their time aggregate varies from Region to Region. But, a recent survey showed an average of 1¼ hours' radio time per week per Region. Some officers have preferred talks of two to four minutes, while others have preferred talks or discussions of eight to ten minutes.

To illustrate the progress and today's status of radio in extension activities: Western Region, established in 1953, commenced to use radio in 1954-55; and that year there were 399 broadcasts by officers. In 1961-62, the total of individual broadcasts was 743, averaging in excess of two broadcasts per day. In North Western Region, headquarters Gunnedah, there were 570 radio broadcasts this year, occupying 57 hours' radio time. Mid Western Region, headquarters Cowra, made 772 broadcasts this year—86 hours' radio time.

Press Use.—Yearly the typical Region issues about 400 publicity statements; copies of them go to all local newspapers. A survey in the South Coast and Tablelands Region has shown that 80 per cent of its press releases are being published. The figure is estimated to be similar in the other Regions.

Extension officers have developed means by which their publicity statements are acceptable to editors of localised country newspapers. Frequently the statements quote the writer and/or use the name or comment of a local farmer appropriate to the newspaper's distribution area. Personalisation of the statements has popularised them.

In Northern Region, headquarters Tamworth, a weekly column titled "Ruralettes" is used by the Northern Daily Leader newspaper. This circulates throughout the north and north-west, and the column is used to place articles by extension officers. Northern Region made 418 individual press releases this year.

Film and Slide Evenings.—All extension officers have one or more high quality 35 mm. cameras in their office. Consequently, many officers have a good collection of 35 mm. diapositives for use in 35 mm. projectors. Some officers have

built a complete slide sequence about certain topics; such as "Conservation of Fodder", "Milking Machine Hygiene", "Drenching of Stock", "Pruning of Orchard Trees", etc.

There is also a 16-mm. cine film projector at each country office, and film loans are secured from the Division of Information Services, the N.S.W. Film Council, and other libraries, for local screening itineraries.

In the use of slides and films as extension aids, remarkable advances have been made in recent years by field officers. The past year has been no exception.

Location of Bulletins and Pamphlets in Regions.—In earlier years, field officers wrote direct to the Division of Information Services for supplies of Departmental publications for issue to farmers. Now there is at each Regional headquarters sufficient shelving to hold many thousands of the free publications, and from this source district offices get their requirements. The scheme has operated very satisfactorily.

Requests by Farmers for Agricultural Publications.—Many thousands of letters are received at head office from farmers and rural people requesting information and, in some cases, specific publications. After supplying the leaflets and information, head office personnel short-term filed and ultimately destroyed the letters. Now, when the leaflets are supplied there is with them a note suggesting that the enquirer's contact be made in future with the local Department of Agriculture office. Moreover, the enquirer's letter is sent out from head office, through the Regional Extension Services, to the appropriate rural officer—so that they will know of the enquiry and take such follow-up advisory action as may be thought fitting.

Yass Valley Study.—In the special Southern Tablelands project known as the Yass Valley Study, commenced in 1957 as a joint project by the N.S.W. Department of Agriculture and C.S.I.R.O., an assessment was made of the current agricultural position in the Yass Valley. Problems seemingly in the way of reaching the potential production based on present-day agricultural knowledge have been defined.

The Study was completed early in 1961. Reports were prepared on soils, stock, pasture, fodder conservation, tree planting and water supplies.

"Yass Valley Organisation" Formed.—A body known as the Yass Valley Organisation (Y.V.O.) has now been formed, representative of 28 organisations including the C.S.I.R.O., Department of Agriculture, Stock and Station Agents, Farmers' Groups, Banks and The Agricultural Bureau. The Y.V.O. aims to be a link between research and extension workers and the farm. An "Operation Tintacks" project has been named to prove results of the Study and to apply facts known from research.

An officer of the C.S.I.R.O. has accepted secondment to the Department of Agriculture for one or more years, to be Executive Officer of the Y.V.O. and to further "Operation Tintacks" on a number of properties.

Special Notes on Specific Regions

Mid-Coast and Hunter Region

Irrigation School for Farmers.—In the Hunter Valley, where there is about a third of the State's spray irrigation, an Irrigation School was conducted at Muswellbrook in September, 1961. Thirty-five farmers constantly attended.

Dairy Hygiene Field Days.—Over 70 field days were conducted in the Region this year, and amongst them was an important series on dairy hygiene promoted by the Taree dairy officer. Milk and cream quality had deteriorated through failure of hygiene in milking yards and dairies. The field days, aided by press and radio publicity, have led to marked improvement in quality of the milk received by local factories.

Mid-Western Region

Cotton Production.—Increasing interest is being shown in cotton growing in this Region. At "Jemalong" Station, near Forbes, where 150 acres of cotton promised a satisfactory crop, a field day was held; 230 people attended.

North Coast Region

Expansion of Agricultural Bureau Activities.—When the North Coast Region was established in 1953, there were four branches of The Agricultural Bureau. This year there are 34 branches actively co-operating in organisation of field days, schools and conventions.

Active Advisory Committee.—As in the case of Advisory Committees in other Regions, this Region's Advisory Committee has actively drawn the Minister's notice to matters of Regional importance. This year some of these were:—an economic survey of the marketing of bananas; administration of the Dairies Supervision Act; promotion of artificial stock-breeding at Dorrigo; and improved research accommodation at the Agricultural Research Station, Wollongbar.

Publicity for Research.—The Region used 151 hours of radio time through stations at Lismore, Murwillumbah, Kempsey and Grafton. Publicity service through radio and press was given to other Department of Agriculture institutions, including the Agricultural Research Station, Wollongbar; Grafton Experiment Farm, and Alstonville Tropical Fruit Research Station.

Northern Region

Extension in the New England Tablelands.—An organisation known as New England Rural Development Association, working in close association with the Department of Adult Education of the University of New England, has 64 "Neighbourhood" groups. Through these it conducted a "Problem Census" in 1961.

A report published by the University of New England in March, 1962, states in part that "The lack of extension teaching and advice was the largest and most important problem identified by this survey, for over 50 per cent of all groups in every area listed lack of extension advice as a major problem." There is a strong feeling that the University in part has ambitions in the field of agricultural extension.

Annual Weeds School.—This was held at Tamworth in spring, 1961, to demonstrate the latest herbicides and methods to organisations interested in weed control. It was not a farmer school. The 30 delegates were from four County Councils, five Shire Councils, five Pastures Protection Boards; and a spraying contractor; and came from as far afield as Tenterfield, Moree, Coonamble, Mudgee and Scone.

North Western Region

Major Cotton Field Day.—Cotton growing under irrigation, since establishment of Narrabri Experiment Farm, has gained great interest in the north-west. At Wee Waa, where two growers grew a large area last year, with high commercial yields, an autumn field day was held. Modern harvesting equipment was demonstrated to an attendance of 1,200 people.

South Coast and Tablelands Region

Television Affects Group Extension Work.—Television is in operation at Canberra and Wollongong, and most centres in the South Coast and Tablelands Region reasonably receive those two and/or a Sydney Channel. The Regional Supervisor has commented that rural people who have acquired T.V. sets prefer to stay at home now at night. There have been poor attendances at many night meetings arranged to provide extension service talks and demonstrations. At least three branches of The Agricultural Bureau have already succumbed to the effect of T.V. The Regional Supervisor feels this to be a twofold challenge: demanding advice to rural organisations on how to meet the position, and demanding good use of T.V. by the extension workers.

Southern Region

Farmer Clubs for Rural Advisory Services.—Southern Region shows most development of the concept of farmer-employed advisers. At Wagga there are two "Regional Advisory Services" and this year a further group formed at Harden. A fourth group will commence at Holbrook later in 1962. Other districts, Culcairn and Cootamundra, are formulating a similar step. In addition, a private Farm Consultant at Albury is operating extensively, advising farmers in N.S.W. and Victoria.

South Western Region

Woodlots in the Irrigation Areas.—The officers have shown considerable interest in establishment and management of woodlots. Trial areas have been planted on different soil types. Three were planted on "treeless plain soils" at Tullakool in 1957, and all have made good growth. Some are now over 20 feet high. Woodlots planted in the Deniliquin and Barham district in 1959 include 25 species under trial. These have made good progress and created considerable interest.

Dairying Continues to Expand.—There has been a big development in dairying in this Region in the past nine years. Of the 250 registered dairies, 40 commenced operations this year and another 20 farmers have dairies under construction.

There has also been a swing to bulk milk-collections. One year ago one factory bulk-collected from a few farmers. Now four factories are operating bulk milk-collections.

Western Region

Expansion in Fruit Production.—The area of commercial orchards in the Western Region is 11,000 acres, which is 20 per cent more than 10 years ago. Orange, headquarters of this Region, is the main pome and cherry producing area of the State. The apple crop there has increased from 500,000 bushels to 1,000,000 bushels per year, over the last 10 years.

The District fruit officer at Orange has as a programmed objective the improvement of fruit grading, packing and presentation. A meeting to discuss the aim was attended by 95 growers, and in due course the special Fruit Packing Instructor conducted fruit packing classes over a period of six weeks in 1962. Altogether, 110 persons received instruction, whilst many fruit growers and their employees attended special classes. All attained a good level of efficiency. Some have taken work in packing houses and are packing 70 to 80 cases daily. The project has considerably improved the district's standard of fruit packing.

Commonwealth Extension Grants

Commonwealth Extension Services Grant.—The Commonwealth Government in 1952, established a system whereby funds have been granted to the States to expand and improve agricultural advisory services to farmers.

In the interim the amount expended by N.S.W. on projects approved under the Commonwealth Extension Services Grant has totalled £605,640. The main types of projects and the money expended on them have been as follow: field assistants and transport, £186,000; pasture and crop demonstrations, £108,000; publicity officers and publicity, £78,000; trainees at Universities and cadets at Colleges, £62,000; extension aids equipment, £60,000; books and publications, £35,000; livestock demonstrations, £28,000; fruit industry projects, £16,000; miscellaneous, £32,000; total £605,000.

The Commonwealth Extension Services Grant has been a major factor in providing many requisites to and improving the N.S.W. advisory services.

Commonwealth Dairy Industry Extension Services Grant.—In 1948 the Commonwealth Government made a special grant of funds, initially for a period of five years, to improve dairy industry efficiency. The grant was to be used, to encourage improved practices in the dairy industry, by allocation of funds to extension service projects. The Grant has been renewed at five-year periods from 1948. A meeting of representatives of the Commonwealth and States will be held later in 1962, in respect of a case for continuation of the Grant until 1968. The allocation to New South Wales is £64,888 per annum. It is of interest that demonstrations have been conducted on not less than 1,180 dairy farms.

From 1948 to 30th June, 1962, the total of £885,510 has been expended in N.S.W. from the Dairy Grant. The main types of projects and money expended on them have been as follow: Herd Recording, £310,505; farm demonstrations, £169,159; field assistance, £154,020; publicity and extension aids, £88,332; establishment of artificial-breeding, £55,636; sire and infertility surveys, £38,459; milking machine efficiency surveys, £35,625; trainees at Universities and cadets at Colleges, £24,000; dairy farm competitions, £7,438; and overseas visits by officers, £2,335. Total £885,509.

HAWKESBURY AGRICULTURAL COLLEGE

Staff

Position of Principal.—Mr. H. R. Richardson, who had been Principal for 6½ years resigned as from the close of 1961.

Mr. B. Doman, formerly Principal of Wagga Agricultural College, was appointed Principal.

Death of Mr. J. Meade, Lecturer in Microbiology.—The death of Mr. John Meade is recorded with deep regret. Mr. Meade, a most co-operative and efficient officer, was a member of the College staff from 1947.

The Diploma Courses

Modifications of Agriculture Diploma Course.—Last year's report mentioned that a Committee set up by the Public Service Board to enquire into the Agriculture Diploma courses at Hawkesbury and Wagga Agricultural Colleges had made certain recommendations to the Minister for Agriculture. Action has been taken on these recommendations.

An Advisory Committee, as recommended, has been set up. The Committee held its first meeting on Tuesday, 1st May.

Standard of entry has been amended. Following implementation of the Wyndham Report in the Secondary Schools, the minimum entry need for the Diploma Courses should be the 4-year School Certificate, with the proviso that in the future certain standards in some subjects might be required. In any case, as from 1963, the only Intermediate Certificate holders enrolled will be those who have the External Intermediate Certificate; provided that those who had passed at the Internal Intermediate Certificate examination prior to 1962 would be accepted also.

To raise the standard of the H.D.A., the content of the Course is being examined and will be subject to suggestions from the Advisory Committee.

The system of two academic sessions per year ended in 1961. A three-term year commenced in 1962. Vacation work arrangements has been amended in the change. Students must now get at least eight weeks experience on two or more private farms. This is a prerequisite to their Diploma.

Saddlery Instruction ceased at the end of 1961. The time for this subject has been given over to Welding Instruction. This is in keeping with the times.

A Farm Certificate Course of one year's duration is to be started at Yanco Agricultural Research Station commencing in January, 1963. A Departmental Committee, including the Deputy Principal of this College, has been laying down details of subject matter for this Course.

The Farm Certificate Course, Yanco, is for farmers' sons or others intending to go on the land, either as managers or to work their own properties. It will not have the professional status of a Diploma in Agriculture and therefore is not a course for those who hope to enter the government services as extension workers or private industry as technical advisers. The standard of entry will be the Intermediate Certificate.

Student Enrolment Statistics.—This year 244 students (243 last year) were admitted. This was possible by occupying some rooms normally used for staff. Of the 244, 187 are in the Agriculture Course, 32 in the Dairy Technology Course, and 25 in the Food Technology Course, the latter being six more than last year. This increase in Food Technology students has correspondingly reduced the admissions to the Agriculture Course.

Waiting Period for Entry to Agriculture Diploma Course.—The waiting period for the Agriculture Diploma Course has increased. The last student admitted had his application in for five years. The waiting period is somewhat less for the farmers' sons (just over three years). Their admission is made on the basis of one farmer's son for one non-farmer's son.

Educational Standards of Entrants.—Most students enter the College Diploma Courses with higher than the present minimum standard which is the Intermediate Certificate. The educational standard of entrants this year is as follows:—

Standard	Agri. per cent	Dairy Tech. per cent	Food Tech. per cent
Leaving Certificate Pass	55	25	79
Leaving Certificate Fail	16	19	7
4th Year Secondary School	11	6	nil
Intermediate Certificate	18	50	14
	100	100	100

This year the percentage of entrants of only Intermediate Certificate standard into Agriculture was 18 per cent as against 20 per cent last year; into Dairy Technology 50 per cent as against 35 per cent last year; and into Food Technology 14 per cent as against nil last year.

Diploma Examination Results.—Fifty-seven Diplomas in Agriculture, 13 in Dairy Technology, and seven in Food Technology were awarded on the 1961 examinations. Nine Class II Honours were awarded in Agriculture, and in each of the Technology Courses two Class Ii Honours were awarded.

Places of Employment of the Diplomates.—Of the 57 Agriculture Diplomates from the 1961 examinations, 22 are employed on farming and grazing properties; eight entered the State Department of Agriculture, and eight entered other governmental agencies. Private firms accepted 11 as technical representatives and in other capacities. Five entered companies associated with agricultural and pastoral industries. One has gone overseas to gain further experience. One has entered the teaching profession and one has entered other employment.

Thus, 38 Diplomates of the 1961 class are either on the land or employed in governmental agencies affecting agriculture. Those in the latter category, plus the 16 employed by private firms, are directly or indirectly applying their College training to the promotion of better Agriculture.

Farmers' Sons in Agriculture Diploma Courses.—At present, of 187 students in this Course, 70 are the sons of farmers. The percentage is too low, if the original objective of the College to train young men for the land is kept in mind.

The Dairy and Food Technology Courses; National Acceptance.—The national acceptance of the training in the Dairy and the Food Technology Courses has again been shown by entrants from other States, and by the employment of many Diplomates in other parts of the Commonwealth.

Admissions to the Dairy Technology Course this year included one from Western Australia, two from Queensland, one from Tasmania, two from South Australia, and 10 from New South Wales. Employment of the 345 Diplomates from this Course since 1928 has been as follows: New South Wales 247, Victoria 43, South Australia 15, Tasmania 13, Queensland 14, Western Australia 7, Australian Capital Territory 2, outside Australia 4.

The first Diplomates of the Food Technology Course completed their course in 1952. The 60 diplomates up to 1961 are now employed thus: New South Wales 34, Victoria 17, South Australia three, Queensland three, overseas three.

Students' Tours and Visits.—The annual instruction tours and visits to places of interest were conducted as usual.

Student Extra-Curricula Activities.—The Students Representative Council, the Sports Club, the Debating Society, the Camera Club, the Student Christian Movement and the College Branch of the Agricultural Bureau, all contributed to the promotion of the social life and welfare of the College. Teams represented Hawkesbury in the Australian Colleges Inter-collegiate contests in Rifle Shooting and Tennis at Gatton in Queensland.

Short Course Schools and Conferences.—Short Course Schools for farmers in Dairy Farming, Poultry Farming, and Tractor Maintenance were attended by 182 farmers. The School in Pig Raising was cancelled due to the Swine Fever outbreak in this State. The School for Junior Farmers, in Dairy Farming, was attended by 28 young farmers.

A Food Technology School for Factory Foremen.—This was the third school of the sort in Australia. It was attended by 40 men from various States. Combined success of this School has been most pleasing. It has the support of the food industry in all States.

Refresher School for Buttermakers in New South Wales.—Thirty-four people attended. The School was an outstanding success and appears to have contributed to improvement in the condition and texture of New South Wales butters.

Dairy Factory Apprentices School.—This was attended by 27 apprentices.

Youth Leadership School.—This, promoted by the Department's Division of Information Services, was attended by 27 young men.

Summer School in Apiculture.—Held again in January, this was attended by 19 people.

University Student Courses.—The College provided the usual practical demonstrations in Farm Management and Machinery for students in the Second Year of the University of Sydney Agricultural Science Course.

Technical Education Correspondence Students.—Twelve Department of Technical Education correspondence students in Agriculture were accommodated for one week's practical tuition.

College as Venue of Conferences.—The facilities of the College were made available for residential conferences of Farm Managers, Horticultural Officers, the Society of Dairy Technology, and the Agricultural Bureau (two State Congresses).

Sectional Operations at Hawkesbury

The various farm sections continued their normal work of production, instruction, demonstrations and research.

Farm Section

Flood Rains.—Heavy November rains yielded 1,567 points in two weeks. They caused local flooding on the College, a record major flood on the river flats, and complete loss of established crops and pastures on flooded areas. December-January-February, 1962, rains were followed by 8¼ inches in early May. These delayed farming operations generally, and particularly fallow preparation for the 1962-63 cereal cropping. Then dry weather in late May and June was adverse for establishment of winter crops and pastures.

Water Storage and Irrigation.—Water storage and irrigation from the Turkey Nest dam again functioned satisfactorily. Electrification of the pumping units both in and out, is required for complete efficient working of the scheme.

The Hillside dam again failed to hold at top water level and the second repair of this dam is proposed. Extension of the main to connect the two dams was completed. Subdivision of the Richmond and Blacktown irrigation areas according to the Water Conservation and Irrigation Commission plan is in progress.

A further 30 acres have been cleared and sown to a cleaning crop of wheat this autumn. This completes the preparation of 112 acres of land for proposed irrigation from the Richmond sewerage effluent.

Clearing.—A further 200 acres of timber was pulled down and windrowed. Burning and cleaning up of this area is continuing as weather permits.

Pasture Improvement.—Due to the adverse season for seed bed preparation only small areas totalling 20 acres were seeded to pastures this autumn. A maximum area of 200 acres of good potential sub-rye and white clover pastures was top-dressed with 2 cwt. of super per acre.

New Fencing.—New fencing completed totalled about 2½ miles. Local round box timber treated with chrome-copper-arsenic, with both the sap displacement and pressure treatment processes, was used. These posts cost 5s. each, compared with 8s. each for split ironbark.

Tractors and Machinery.—In part by purchase and in part by "on loan" issues from machinery firms, several additions and replacements were made.

Orchard Section

Investigations.—Records of blossoming and fruitfulness of persimmon varieties were obtained. Seeds for identification purposes have been added to the collections already made. Varieties which have been properly identified will be propagated to raise new trees for further investigational work.

Data on the performance of the various stock-scion combinations in the Washington Navel Rootstock Trial were obtained. Details of the percentage juice, acidity and total solids were recorded. Estimates of yield and a record of size of fruit from each stock were obtained.

Assistance was given in the "Fruit Fly-Male Attractant" investigations conducted in Richmond-Windsor districts by the Entomology Branch, Division of Science Services, and the Division of Horticulture. Inspection and recording of trappings, and spray bait applications, were done in the town of Richmond during the main summer months.

Development and Reconstruction.—Further small plantings of stone and citrus fruit trees were made in the programme for planting new trees each year to provide trees of all ages for student instruction.

The area of new vineyard planted with *Phylloxera*-resistant stocks (106.8) is now trellised. Rebudding was done where previous Yema buds had failed.

Some Homosassa orange trees were planted, in the programme of progressive plantings of citrus, and the first of a number of rows of peach trees was planted, to the variety Blackburn.

Provision has been made for seed bed and nursery plantings for the raising of rootstocks and propagation of trees. All main fruits are being propagated, to provide for student instruction and to supply trees and vines for College Orchard requirements.

The reconstruction of portions of the Orchard, and the policy of progressive plantings of fruit trees, are now giving beneficial results in student instruction and in fruit production.

Extension Service from H.A.C.—Extension Service has operated from the College during the year. Extension facilities normally covered by the Division of Horticulture have been carried out in the Windsor-Richmond Municipality by the Special Fruit Officer, Hawkesbury Agricultural College. Demand for the services offered was heavy. It greatly increased as a result of flood damage.

Sheep and Wool Section

Experimental Work.—(1) *A production per acre experiment* was conducted in co-operation with the Agronomy Section. It compares the results of stocking 10 ewes per acre, eight, six, and two ewes per acre on two-thirds (⅔) irrigated pasture against a control of one ewe per acre on native pasture. Preliminary results indicate that approximately eight ewes per acre is the optimum, i.e., 12 ewes per irrigated acre.

(2) A large-scale trial was conducted in co-operation with the University of New South Wales to confirm the previous year's results: (a) To test the possibilities of *synchronisation of oestrus* using Progesterone and P.M.S. A variation introduced this year was oral administration in some groups. (b) To test the *fertility of ram semen* after 34 hours' storage. For these trials 500 merino ewes were agisted at the College for 4½ months.

(3) The trial to compare *as fat lamb sires* the Dorset Horn and Cheviot breeds was continued.

Flock Statistics.—At 30th June, 1962, the College flocks totalled 885 head; including 230 Commercial Flock ewes, 285 Experimental Flock ewes, 105 Commercial Flock rams, and 265 ration sheep.

The 1961-62 shearing yielded 35 bales, weighing 10,886 lb.

Percentage of Lambs Marked.—From 64 Romney Marsh ewes mated the lambs marked percentage was 72.0; in the Commercial Flock from 407 ewes mated the percentage was 101.0; in the Experimental Flock—production per acre experiment—from 87 ewes mated the percentage was 114.9, and from the Experimental Flock—breed comparison experiment—from 120 ewes mated the percentage was 94.2. Overall, from 678 ewes mated the percentage lambs marked was 98.6.

Dairy Cattle Section

Friesian Cattle at Shows.—At the 1962 Sydney Royal Show, the College for the second time in succession was Most Successful Exhibitor in the Friesian Section. The team of 12 head gained 22 awards, including Senior Champion Bull, "H. Prince Regent", Reserve Junior Champion Bull, "H. Royal Master" and five Firsts, five Seconds, one Third and eight Fourths.

A smaller team than in previous years was exhibited at the Hawkesbury District Show this year, but the 11 head gained 16 awards, including Champion Bull, "H. Destiny Conqueror", Champion Cow, "H. Fond Colleen", Junior Champion Bull, "H. Bonnie Voyageur 2nd", and four Firsts, five Seconds and four Thirds.

Friesian Stud Statistics.—At 30th June, 1962, the Friesian stud totalled 140 head, nine less than at 30 th June, 1961. It comprised six adult bulls, six "loan" bulls, 46 cows in milk, 13 cows dry, 27 heifers, and 42 calves under 12 months.

Births for the year totalled 63, comprising 40 males and 23 females.

Friesian Stud Sales.—Sixteen Friesian males, for 1,233 guineas, and seven Friesian females, for 580 guineas, were the sales for a total of 1,813 guineas. Demand both for males and females continued high. There is a large waiting list for the Friesian stock.

Friesian Breeding Programme.—An analysis of Friesian females, excluding purchased cows and foundation stock, shows that the females have been sired by no less than 15 bulls.

As well as the imported bull "Sniders Fond Hope King", his son and grandson have been used recently.

"Sniders Fond Hope King" progeny achieved commendable results at the 1962 Sydney Royal Show, including his son "H. Prince Regent" (Senior Champion Bull) and grandson "H. Royal Master" (Reserve Junior Champion Bull). His female progeny received many awards, amongst them being "H. Fond Bonnie", "H. Fond Maid" and "H. Fond Colleen". They were First in their classes. "Fond Colleen" also won the "best udder" class.

Through artificial insemination the bulls "Frasea Lord Jewel" and "Braeburn Carnation Cavalier" have been used, but production results are not available.

Two Friesian bulls, "Fintdave Theo Conqueror" and "H. Bonnie Voyageur 2nd", have been forwarded on loan to Berry A.I. Centre for possible future use in A.I.

Herd Averages.—Latest Official Recording results, for the period 1960-61, show that 51 cows averaged 12,110 lb. milk, and 435 lb. butterfat, with an average test of 3.6 per cent.

Milk and Butterfat Production.—Results for 1960-61 Recording period were:—

Two Year Olds: four averaged 9,251 lb. milk and 334 lb. butterfat.

Three Year Olds: 18 averaged 10,268 lb. milk and 379 lb. butterfat.

Four-Nine Year Olds: 27 averaged 13,660 lb. milk and 485 lb. butterfat.

Ten Year Olds: two averaged 13,462 lb. milk and 468 lb. butterfat.

Trials and Experiments.—Trials in progress at present include: Growth and Development Studies of Friesian Calves; Solids-Not-Fat in the Friesian Herd; Staphylococcus Toxoid Vaccination Trial; and the Identical Twin Heifer trial.

Beef Cattle Section

Poll Hereford Stud.—This stud now totals 69 head; 57 females, three adult bulls, and nine young bulls. Of these, one of the three bulls in use, "Pylara Taurus", has been with the stud since its foundation in 1956, but is on loan to the N.S.W. Milk Board, and located at Berry Artificial Stock-breeding Centre.

Progeny of the bulls "Pylara Jock" and "Dananbilla Hector 2nd" are being reared. The oldest are up to 20 months.

Commercial Herd.—This now totals 42 head of horned Hereford heifers; the nucleus of a commercial beef herd under formation.

Ration Cattle.—These totalled 82 at 30th June, 1962. In the 12 months 108 have been killed for rations and 133 have been received from other farms and/or herds, including culls from H.A.C. Friesian Stud.

Poultry Section

Breeding.—Poultry and turkey breeding activities proceeded. Because both sample size and number of entries accepted in the Random Sample Laying Test increased, hatching of College stock was considerably reduced.

Egg Laying Competition.—The Sixtieth Egg Laying Competition ended on 22nd March, 1962. A full report has since been published.

The sixty-first Competition began on 1st April, 1962. In this, an Egg-to-Layer Test was introduced. Samples of 30 eggs were collected from breeders, and hatched at the College; and from the resulting progeny six pullets, selected at random, were entered in the test. The period of testing for egg production coincided with the period of the Egg Laying Competition.

Random Sample Laying Test.—The Ninth Random Sample Laying Test ended in November, 1961, 462 days from the actual hatching date of each sample. A full report has since been published. The Tenth Random Sample Laying Test began in August, 1961.

Random Sample Broiler Test.—The Second Random Sample Broiler Test began in January, 1962. It was conducted for eleven weeks. A full report has since been published.

A further broiler test, designated "The Australian Random Sample Broiler Test", was begun in May, 1962. It will end on 2nd August (a period of ten weeks), so that the results may be announced at the 12th World Poultry Congress. Applications were invited from all States. This brought eleven entries from New South Wales, three from Victoria, one from South Australia and one from Tasmania.

Two large intensive rearing sheds were equipped with electric lighting and electric brooders, to rear the chickens in the Random Sample Broiler Tests.

Poultry Experiments.—An experiment to compare effects of arsonic and arsonilic acids on chicken growth was conducted in conjunction with the Poultry Research Station, Seven Hills. Results were publicised in a press release by the Seven Hills Station.

A test of the efficiency of whole grain protein concentrate *vs.* mash and grain feeding of hens was begun on 21st March, 1962. It will continue for twelve months. Alternate pens in the same experiment have drink nipples or nipples plus troughs.

Annual Poultry Farmers' Field Day.—This was held in June and attracted about 1,000 people. As well, thirty firms catering for poultry industry needs displayed merchandise.

Piggery Section

Health and Quality.—The necessary standards were maintained. Early in the year the Swine Fever outbreak in the Sydney-Newcastle area necessitated placing the Section under protective quarantine. The stringent measures taken have so far been successful. Also, 118 pigs were sent to Glenfield Veterinary Research Station for use in Swine Fever diagnostic research.

In May, 1962, an additional Landrace Boar was received from a stud at Arcadia.

Student Demonstrations.—The oat crop was used to demonstrate correct pasture management using strip-grazing techniques. A section was set aside as a demonstration of the various abilities of pigs of varying ages to utilise crops and to show the effects of slow and quick growth patterns on carcase quality.

Present Breeding Stock.—There are eight boars and thirty-two sows, comprising: Large White—two boars and twelve sows; Tamworths—one boar and six sows; Berkshires—two boars and six sows; and Landrace—two boars and eight sows.

The overall total of stock at the Piggery at 30th June, 1962, was 180 head.

Apiary Section

Poor Season.—The past season has been one of adverse conditions for bees throughout the Hawkesbury district. As a result, no honey was available for extracting and the number of hives was reduced. Several colonies required feeding.

Bee-breeding Programme Upset by Flood.—The record flood in November, 1961, carried away the River Farm Apiary of twenty productive hives and a number of nucleus colonies used for the raising of hybrid queens. Work in the bee-breeding programme was seriously curtailed, and it was possible to raise only queen bees for sale to apiarists. In all, 131 were supplied.

Summer School and Field Day.—The annual Summer School in Apiculture was held from 2nd to 11th January, 1962. A field day with the Amateur Beekeepers Association was held in February.

Statistics.—At 30th June, 1962, there were sixty hives and fifteen nucleii, compared with ninety hives and forty nucleii a year earlier.

Veterinary Section

Disease Prevention.—Routine testing and vaccination were continued, to maintain the various herds and flocks on the Brucellosis, Tuberculosis and Pullorum-free schemes. Quarantine measures were maintained to prevent entry of Swine Fever into the pig herd. The herd was tested for freedom from this disease.

School of Dairy Technology

Intake of milk was lower than for some years, but this did not seriously affect student training. It reduced the manufacturing turnover of milk powder and cheese.

Factory Plant, Equipment and Operation.—Factory plant, equipment and buildings were adequately maintained.

The Kolding milk pasteuriser was delivered in February and immediately went into use in the cheese section.

Most cheddar cheese is now film wrapped. The equipment is operating satisfactorily.

A contract for a new milk bottle washer, filler and capper has been let to Anderson Equipment. At twice the capacity of the present plant, it will bring the market milk section up to date.

A new stainless-steel butter tray was provided during the year to replace the obsolete wooden unit.

A 1,000 gallons per hour whey separator has been installed in the powdered milk section. It should return up to £500 per year on butterfat recoveries.

Public Works Department investigated the steam-raising capacity and recommended provision of a Babcock and Wilcox water tube boiler as the main supply unit. Cost has been estimated as £32,000. The present boiler would be held in reserve.

Butter Production.—This reflected the heavy, summer farm production. Quality was better than in the previous year.

Cheese Production.—This was down some 20,000 lb. due to light, autumn production. The change to film wrapped cheese will enable all cheese to be matured at the College, and an overall return greater than when it was necessary to forward green cheese to the local market.

The usual small quantities of Edam, Blue Vein and Roman cheese were made.

Carton Products.—Carton milk products have had steady sales, enough for good training of students in this aspect of packaging. Cartoning of ice cream mix for the vendor trade has been well received, though essentially a summer market. "Cream mix" sales have been reduced to negligible quantities, since the reduction in price of normal cream.

Production of Milk Powder.—This followed the downward trend of milk supplies. All stock was cleared locally at the ruling price.

Factory Production Statistics.—In 1961-62 the Factory produced 263,268 lb. butter, 121,244 lb. cheddar and 870 lb. fancy cheese, 2,202 gallons ice cream, 57,524 lb. dried milk, 71 gallons condensed milk, 86,960 cartons (¼ pt.) flavoured milk, and 169 gallons cream mix, and handled from various sources more than five million gallons of milk.

Dairy Research

Milking Machine Research.—The detergent testing unit is now ready to operate. Two direct-reading air flow meters have been received from England and will be set up for testing vacuum regulators for compliance with the new Standards of Performance. A similar task must be undertaken for end-of-milking indicators. This entails the setting up of accurate milk flow measuring equipment.

The report on results of the Milking Machine Survey has been written up as a farmer bulletin. When published it will be a useful handbook for farmers. Summaries of the results have been released and have found their way into various publications.

The pure research programme is to include: a study of vacuum stability in the machine during milking; factors affecting milk flow rate and mastitis incidence; management studies to improve the efficiency of labour utilisation; and development of an improved end-of-milking indicator, to help reduce the prevalent tendency to overmilk at a risk of likely mastitis attack.

Research into Blue Veined Cheese Manufacture.—This continued, on funds from the Australian Dairy Produce Board. A full report of this project has been filed as a "Report of Progress to the Australian Dairy Produce Board". The project should not end until manufacturing technique is completely evaluated. A review of relevant research literature was published in October, 1961.

Rapid Methods for Determining the Composition of Milk.—This project will continue in 1962-63.

Types of Salt and Their Use in Butter Manufacture.—A dairy chemist is evaluating the types of salt used. He will liaison with factories throughout the State.

Bitterness in Cheese.—This is under investigation.

Oxidisation of Milk.—The research officer on this project is working almost full time at this in the Milk Board Laboratory at the University of Sydney.

Food Technology Section

Equipment and Facilities.—Assistance from industry included the long-term loan of a Time, Pressure and Temperature controller for the cannery retort. With the associated motor control valves donated, the value is about £1,000.

Purchases and installation of equipment included a larger capacity "twin" air compressor and a water re-circulation system for the refrigeration equipment. The cannery boiler was overhauled and new tubes installed.

Processing Operations.—Despite the needed volume of production for College use, the basic aim of the practical cannery operation remains education. The aim has been to familiarise the students with principles and concepts in the manufacture of the commonly marketed foodstuffs. Over 70 different packs were again processed by the Food Technology Students this year.

Production Statistics.—All vegetables processed were grown on the College. Production of processed vegetables amounted to 13,500 lb. consumer products, including about 8,000 lb. canned vegetables, 5,000 lb. quick frozen vegetables and 500 lb. dehydrated vegetables.

Fruits and fruit products processed amounted to 20,000 lb., including 7,000 lb. canned fruits and 13,000 lb. fruit pulps. Small amounts of dehydrated fruits were also produced. Citrus was from the College and other fruit from various Departmental Farms.

All College requirements of jam, over 4,000 lb., were supplied by the Cannery. Most of the pulp for the jam was processed at the Cannery.

Quick-frozen poultry, vacuum packed, totalled 2,600 birds.

Fruit juices, fruit pulps, soups, meat products, condiments, and a miscellany of other lines were also processed.

Agronomy Section

District Trials.—Several weed control and vegetable trials were carried out on farmers' properties in this district. Also, vegetable trials, weed control tests, and plant nutrition trials were established in other districts by College agronomists.

Extension Activities.—Information and advice was given to many people by telephone, letter and personal contact. The enquiries tended to concentrate on weed control, vegetables, and pastures. The agronomists also addressed field days and farmers' schools at the College and in this and other districts.

Lectures to Students.—The research agronomists also gave a number of lectures and demonstrations to College students on matters arising from the current lines of research.

General Production.—Most of the vegetables required by the College kitchen were supplied by the Section. Also, vegetables were produced for the College Cannery and for the C.S.I.R.O. Division of Food Preservation.

Research with Other Organisations.—Co-operative research work has been undertaken with the Universities of New South Wales and Sydney, the C.S.I.R.O. Division of Food Preservation and Division of Plant Industry, the Australian Atomic Energy Commission, Divisions of the Department of Agriculture, other State Departments and Authorities and commercial firms.

In a co-operative research programme with Geigy Agricultural Chemicals, this firm has located a research assistant at the College.

Pasture Investigations.—Agrostology work at the College continued on a restricted scale and was concerned mainly with the potential of improved, irrigated pastures for fat lamb productions. Work has been done also on the lucerne persistence problem. Pasture species improvement has been confined to evaluation of new species, and continued testing of commercial species in rows and swards in the observation nursery.

Vegetable Investigations.—The trials included a study of the effect of Potash and Boron on cauliflowers and the effect of selective Gametocide on tomatoes.

Work continued on vegetable breeding, and on introductions from overseas and local sources.

Very favourable reports have been recived from all over Australia, on the new variety of tomato "College Challenger" and the new bean variety "College Pride".

Weed Control Investigations.—A comprehensive range of successful trials was again undertaken on and away from the College.

More emphasis than in the past was given to problems such as chemical residues in soil and to related more basic investigations using controlled conditions of the glasshouses.

Trials have covered vegetables, field crops, pastures, and floriculture.

The soil residues studies, of major importance, were undertaken on soils from other parts of the State where unexpected results have been found. Soils from Cowra, Griffith and Gundagai were involved this year.

Field Crop Investigations.—Work continued on testing varieties of oats; hybrid maize—mid season, late maturing and fertility restored hybrids; spacing trials for maize; variety and spacing tests for sweet sorghum; and variety trials for fodder millet and summer legumes. Rice introductions were tested, but in the environment at the College six of the ten introductions failed to form seed.

Plant Nutrition Investigations.—Fresh work was begun and, due to extra labour, on an extended basis. The work highlighted main nutritive deficiencies. These have been reported to the district agronomists for their evaluation. The lucerne work confirmed previous pot findings and is being extended by local agronomists to field work.

A trial on grades of superphosphate showed a coarsening of the present commercial grade might be advantageous.

Apart from work that extended last year's activities, the current work has been more intensively local. The aims have been closer field, pot, and chemical tie-up, and a possible greater qualitative contribution from the glasshouse. The current work is controlled by a Glasshouse Committee representative of Plant Industry Division at Head Office, Hawkesbury Agricultural College, and Chemistry Branch, Division of Science Services.

Hawkesbury College Improvement Works

Modernising, renovation and re-equipment of all the older buildings continued.

Accommodation Renovations.—With the completion of Potts Block, all student accommodation has been modernised in recent years, including supply of new furniture. There remains only outside painting of all blocks.

The Staff Accommodation Block has been modernised internally and repainted externally.

The Administration Block renovations have now been completed internally and plans are in hand for extensive rebuilding of the main Lecture Hall.

The married residents' cottages, except for two cottages, have now all been renovated internally and most have been repaired and painted externally.

School of Engineering.—Extensive work has been done here. All practical instruction in woodwork, metalwork, welding (oxy and electric) and automotive maintenance and repair, is located in the new centre. Landscaping of the surrounds has been planned.

Agricultural Engineer's Section.—This section has been reorganised and expanded. It now occupies space gained by transfer of practical instruction to the School of Engineering building. The Mechanical-Electrical Section has also been extended. This meets a long-felt need.

New Store.—Construction of a new General Store is well under way. Plans and specifications were prepared by college staff who are also responsible for its construction.

Poultry Section.—Electricity has been installed in the new rearing sheds. This permits chickens in the Random Sample Broiler Test to be reared under electric power brooders from day-old.

The former incubator room has been converted to a modern poultry slaughter-house, fitted with the latest processing equipment. This enables poultry slaughtering under most hygienic conditions.

School of Food Technology.—New equipment purchased by the College for the Cannery included: a single-pan balance for quick and accurate weighing; a new steam-jacketed kettle to operate at higher pressures than those previously installed; a larger air compressor for use in automatic retorting; an air curtain for the cold storage room; and three 15-gallon standard stainless-steel vats. A concrete apron was put down outside the boiler house.

Equipment received on long loan included a complete control unit for regulation of the temperatures, pressure and timing on the retort, and a food pump. A 120 D can closer previously on long loan was returned. Gifts have included an air receiver for the Cryovac Packaging Machine, colours, flavours and detergents.

School of Dairy Technology.—Installations included: a 2,000-gallon-per-hour milk pasteuriser for cheese milk, at a cost of £6,000; an 1,100-gallon-per-hour, fully-enclosed separator for separating all whey to recover fat; equipment for research purposes valued at £5,000. Plans have been made for a new boiler to cost £32,000. Tenders have been called for the replacement of the cold water tank at a cost of approximately £2,000.

The Public Works Department completed the construction of a second water reservoir tank, and fire-fighting mains around the School of Dairy Technology.

Agronomy Section.—Two new glasshouses were erected for weeds research work.

Hillside Dam.—This dam, reconstructed after being breached by heavy rains, was again "holed" following extremely heavy rains in November, 1961. Remedial measures have been designed for its reconstruction. Meantime, the extension of irrigated pastures has been delayed.

Sheep Section.—A portable hut was built for use by students doing "dog-watch" at night.

Beef Cattle Section.—Two Bull Sheds were constructed on the Section and housing built over the scales.

Oval.—Because of additional student activity, the oval has been redesigned to allow for two rugby football fields on the main oval, and the soccer field has been relocated near the Poultry Section cottage. The circular running track, also, has been relocated, and the whole football, athletics and cricket fields boundaries have been permanently positioned on a plan.

WAGGA AGRICULTURAL COLLEGE

General

Student Enrolment.—In its fourteenth year, the College commenced curricular activity with a total of ninety-seven students; one more than the 1961 record. The following table compares numerical distribution between the three years in 1962 with those of the previous four years:—

Students	1958	1959	1960	1961	1962
First Year	37	34	35	32	39
Second Year	32	31	31	34	31
Third Year	25	29	30	30	27
Totals	94	94	96	96	97
Percentage of Assisted students	30·9	34·0	28·1	27·6	23·7

The 1962 intake was forty-two new enrolments, but included three admitted to Second Year. Of the thirty-nine admitted to First Year, twenty-four had qualifications in excess of the minimum, including eighteen with the Leaving Certificate. The proportion of admissions with only minimum qualifications, 38.3 per cent, compares unfavourably with the 36.3 per cent for 1961, and more so with the 18.6 per cent for 1960.

Diploma Examinations.—All twenty-six candidates gained their Diplomas, one with Honours, and included one who was successful in a deferred examination during the year. Thus, the total number of diplomates since 1951 is 246.

Statistics of Ex-Students' Occupations.—At 30th June, 1962, there were 339 ex-students (excluding those who were in residence for less than one session). They were occupied as follows:—

(1) Following agriculture—			
(*a*) On farms		153	
(*b*) In Government Departments, or with quasi-Governmental Authorities—			
Agriculture	40		
Soil Conservation	6		
Education	3		
A.B.C.	2		
Valuer-General's	6		
Others	17		
	—	74	
(*c*) In commercial firms		38	
		—	265
(2) Undergoing further training			8
(3) Left agriculture			30
(4) Occupation unknown			33
(5) Deceased			3
			339

Thus, about 80 per cent of the total are applying their vocational training to those rural and allied pursuits for which the curriculum was designed.

Students' Tours.—Educational tours were conducted to the Murrumbidgee Irrigation Areas for Third Year students in October, 1961, and February, 1962, and for Second Year to the Batlow-Tumbarumba districts in November, 1961.

Students gained further experience by acting as livestock attendants and/or by competing in livestock and produce judging competitions at the Royal Easter Show; Wagga Wagga Show, the Wagga Ram Show and Sales, the "Brewarrina" Poll Hereford Stud, Narrandera, and the Wagga Angus Breeders' Show and Sales.

Three-term Year.—Introduction of the three-term year in 1962, in lieu of the previous two terms, was a major change. It brings the College scholastic year into line with other educational establishments. The longer summer vacation period will also enable students to meet the requirement of eight weeks practical work on a private farm.

Curriculum Improvements.—Arising directly from an Organisation and Methods Survey conducted in 1961 by the Public Service Board, action has been taken to implement the first phase of recommendations made. Some Subject Syllabus Committees have been formed to assist and, where necessary, revise the format and content of lecture material, and the nature of demonstrations and practical exercises, and to recommend appropriate subject text-books and references.

Teacher Training.—Arrangements have been made with Wagga Wagga Teachers' College for inroduction of an in-service teacher training course for College lecturers.

External, Lecturing Aid.—As in previous years, the College had the help of Wagga Technical College lecturers for the subjects of Business Principles, Bookkeeping, Mechanics, Farm Engineering, Tractor Maintenance, Woodwork, Metalwork and Woolclassing. The Regional Supervisor's staff (Southern Region) provided instruction in Agricultural Economics and Apiculture. Senior students again had practical instruction in shearing from an outside specialist.

Enrolment Requirements.—Conditions of enrolment are likely to be varied as from 1963, as recommended by the Agricultural Colleges Advisory Committee. From that year candidates who have passed the *external* Intermediate Certificate will be accepted, and from 1966 the minimum entry requirement will be the 4th Year School Certificate.

Students' Extra-curricular Activities.—The College successfully competed at the inter-collegiate sports held in 1961 at Queensland Agricultural College, Gatton.

All new students participated in the annual First Aid course and examination conducted by the District Ambulance Service.

Short-term Schools for Farmers, and Others.—Schools conducted during the 1962 winter vacation included: The 11th Annual Turkey Raisers' School and Convention, attended by a record number of 64. The 11th Junior Farmers' School in Wheat and Sheep Husbandry was attended by 18 young farmers. Thirty-eight Second Year Sydney University Agricultural Science students were in residence for a two weeks' practical course in Farm Machinery and Practical Animal Husbandry. The Departmental Sheep and Wool Officers' Conference was held at the College.

Field Days.—The annual College Field Day, in September, 1961, was attended by 70 farmers and 40 ladies.

The College also co-operated with the Agricultural Research Institute in a cereal research field day. This was held in the College grounds in November, 1961.

Works and Improvements.—Work commenced on the new 64-room student accommodation block. Progress has been excellent. The building includes provision for a sick bay, a dispensary, and a matron's flat. It should be completed by October, 1962. It will enable student numbers to be increased to 120 in 1963 and to a maximum of 134 in 1964.

Bathroom facilities in the centre block were brought to a high standard by remodelling of the eastern end unit at a cost of £1,200.

Irrigation Project.—Progress has been made by the Water Conservation and Irrigation Commission on the construction of a 6½ million gallon capacity ring tank. This is in an area of 160 acres in the south-eastern corner of the College property. It is for irrigation. A building has been put up on the site for machinery storage, and personnel amenities.

Progress Towards Swimming Pool.—Further survey work has been done by Public Works Department. About £18,000 is now available for the construction of the pool. Of this, £8,000 has been raised by local effort. The estimated likely cost is £23,000.

New Honey House.—Construction of a honey house has been almost completed for the new Apiary Section. It should provide adequate instructional facilities.

Turkey Demonstration Unit.—Turkey range sheds and the Random Sample Test unit were completed.

Augmented Water Supply.—The College water supply was further augmented by construction of a 30,000 gallon capacity storage tank. Farm water supply was improved by sinking a 3,000 cubic yard paddock-dam and a smaller 500 cubic yard dam.

Other Works.—Completed during the year were: a hay-feed shed and three new boar sheds at the Piggery Section; seven septic units in cottages and farm sections and connection of other sections to the main sewerage line; erection of a high level water tank at the dairy; re-sealing of 1¼ miles of College drive, and continuation of re-grading and surfacing of 20 chains of College roads; a feed shed at the stud Horse Section; extra grain storage facilities, a further 1,600 bushel silo; planting of 200 tree seedlings; replacement of boundary and subdivision fencing—a total of over 8 miles of fencing erected during the year; replacement of post and rail piggery and sheep yard fencing with steel panels and/or chain wire; extension of water reticulation for permanent lawn sprinklers and better water supply to livestock sections; replacement of verandah flooring in parts of the student accommodation blocks; new tennis courts, and re-surfacing of students' basketball court.

Farm Section Plant and Equipment.—The College took delivery of a new 41-seater Bedford omnibus to replace the previous smaller vehicle.

Other major items of plant were purchased and a number of firms donated or made available on loan to the College considerable materials and equipment.

Sectional Operations at Wagga College

College Farm.—In a season not wholly suitable for the growing of high yielding cereal crops, the College Farm produced satisfactory yields of grain, hay and silage. About 1,500 bushels of wheat were consigned to Hawkesbury Agricultural College; and 420 bushels of grain were distributed to other Departmental institutions, and to private cereal seed growers for pure seed production. The remainder has been stored for feeding College livestock.

The area of sown pasture increased to 959 acres, although some areas previously under sown pasture have been returned to cultivation and cereal cropping. The area sown to lucerne increased to 257 acres. It produced excellent grazing but only a small quantity of hay.

Orchard Section.—The Apple Rootstock trial continued. Results were much to the previous pattern; Northern Spy budded at 24 in. maintained a clear lead for quantity of fruit produced, with sizes well within the best market range.

In the Olive Stock Trial the first crop has been harvested and evaluated.

In the Plum Stocks bud transmitted virus experiment, samples of all the scion/stock relationships were forwarded to Division of Science Services, for propagation and future on-the-spot observations by the virologist.

Another acre has been planted to trees for student instruction.

Horse Section.—There were 62 head at 30th June; three entires, 37 mares, 14 geldings and eight foals. Eleven mares and fillies, three foals and four stallions were sold, for about £2,500, during the year. Four geldings and four mares were transferred to other farms for use as hacks. Nine mares were accepted for service during the season.

The stud exhibited a team at the Sydney Royal Show with fair success.

Beef Cattle Section.—There were 78 stud stock at 30th June; seven bulls, 71 females. The grade stock totalled 15; 10 steers and 5 females. Two bulls were sold. One steer was sold at the Royal Show. The sales yielded £520. Thirty-six head were slaughtered, either for sale or for ration use.

The stud exhibited a team at Wagga Show and the Sydney Royal Show with fair success.

Calves of the new sire (Prongerong Icicle) show great promise of this bull lifting the standard of the herd.

Piggery Section.—An experiment was carried out to determine the effect of Paterson's Curse on pigs (see Animal Health).

In November, 1961, a virus pneumonia eradication scheme was commenced with Tamworth and Berkshire litters. In April-June another three Berkshire litters were put into this scheme. One 7-months-old Tamworth gilt *could* be free from virus pneumonia. Her litter will go under test this year.

Because of quarantine, there was no sale of stud pigs.

Dairy Section.—Herd production showed a slight increase. From 48 cows in the 300 days' lactation test, an average of 447 lb. butterfat (440 in 1960-61) and 8,905 lb. milk (8,769 in 1960-61) was obtained.

The slight increase, in unfavourable conditions and despite the fact that 28 of the cows completing the test were two-year-olds, has indicated the influence of the imported bulls, "Groombridge Triumph" and "The Mount's Orange Boy", on this herd.

"Yanco Conqueror's Birdseye" topped the herd as a mature cow with 688 lb. butter fat and 12,240 lb. milk in 300 days. She carried on for a 365-day test period to produce 792 lb. butterfat and 13,930 lb. milk.

Natural increase in the herd was 23 females and 22 males. Three females and one male were by artificial breeding. Culls to the commercial herd and the abattoir included eight cows and three bulls. Deaths from natural causes, bloat and scours (in calves), amounted to eight head. The herd totalled 140 at 30th June.

Stud sales to the value of about £1,500 comprised 21 males and two females. Demand for stud stock far exceeds supply. The long waiting list exceeds the anticipated supply to the end of 1963 at least.

The College team of Jerseys exhibited at the 1961 Wagga Show gained awards of Champion Bull; Reserve Champion Cow; "All Breeds, Type and Production" Cow; "All Breeds" Best Group (3 females over two years), and the "All Breeds, E. H. Graham" Group Trophy.

Seven were exhibited at the 1962 Sydney Royal Show. They gained one second, two fourth and three fifth prizes.

Recording of birth weights and measurements of newly born calves continued.

The Solids-Not-Fat trial continued to show a very high level of S-N-F throughout the herd.

Sheep Section.—The College co-operated with the C.S.I.R.O. in a pasture species and stocking rate experiment; and with the Agricultural Research Institute in a new experiment involving stocking rate, fertilizer application and pasture production.

Investigations were continued into the problem of low production in Dorset Horn flocks. Suspect "Clover Disease" investigations were continued as were those concerning silage.

Fair success was gained by College sheep exhibited at Wagga Show, with three Firsts and two Thirds from five entries.

Stock numbers increased during the year and are expected to remain at 2,000 to 2,200. Purchases included six stud rams, three Southdowns and three Polwarths. One hundred and eighty sheep were bought for the Agricultural Research Institute trials.

Poultry Section.—Egg production was satisfactory throughout the year, especially in the laying cages.

The first Random Sample Test (turkeys) in the Section was conducted. The aim is to measure some economic factors in commercial breeding. The final determination of the test was on an "income over feed costs" basis. A report was submitted to all competitors and to the press.

Animal Health.—The Piggery Section is still quarantined because of Rhinitis. Tests for swine fever were negative. A scheme for eradication of contagious pneumonia was commenced. Routine tests for Brucellosis and tuberculosis were negative on a herd basis. A project to determine the role of Paterson's Curse in toxic jaundice of pigs was completed but inconclusive. Erysipelas vaccination as a routine policy was commenced.

In the Dairy Section an outbreak of vibriosis occurred. It caused some difficulties in settling cows. A two-herd scheme policy has been adopted to control this disease.

Artificial insemination of cows was continued, but results so far have not been satisfactory, possibly due to vibriosis. Routine tests for T.B. have been done. Strain 19 vaccinations were performed. The mastitis trial has been continued.

In the Beef Cattle Section an outbreak of suspected vibriosis occurred. It caused many interruptions to the breeding programme. Cases of botulism and acute phosphorous deficiency occurred.

Routine T.B. tests and strain 19 vaccinations were done.

In the stud Horse Section, routine vaccinations against strangles and tetanus were performed. Cases of foal pneumonia and azoturia occurred.

In the Poultry Section fowl pox investigations were made. The annual pullorum test did not reveal many reactors, an improvement on the previous year. A mycoplasmosis survey revealed that this disease was present and several outbreaks were treated. Eradication of it by depopulation, and restocking with clean birds, is envisaged.

In the Sheep Section, infertility studies in the Dorset Horn stud continued, with major emphasis on pasture oestrogens. Outbreaks of sheath rot and lice were effectively treated. They were brought in by stray sheep. Three cases of tetanus occurred in the sheep, a first record at the College. An outbreak of laryngeal abscesses was discovered, and the affected Dorset Horn rams are under observation.

GRAHAME EDGAR, Director-General.

16th October, 1962.

APPENDICES

1. Accounts of the Department of Agriculture, 1961-62.

2. The Published Matter, of officers of the Department of Agriculture, 1961-62.

APPENDIX I

The Accounts of the Department of Agriculture, 1961–62

The cost of maintaining the Department of Agriculture is met from the Consolidated Revenue Fund, whilst capital expenditure on buildings and permanent improvements to departmentally-owned property is financed from the General Loan Account. In addition to these general classifications of expenditure, the Department is assisted in the financing of certain specified lines of research and development and the control of insect pests and animal diseases by direct levies on industry and by grants from the Commonwealth Government and public and private organisations. Operations of this nature are reflected in a large number of separate accounts within the general Treasury classification of " Special Deposits Account ", some details of which are given elsewhere in this Appendix.

COMPARATIVE STATEMENT OF EXPENDITURE

Account	1960-61	1961-62	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Consolidated Revenue Fund	4,023,337 12 10	4,315,196 17 8	291,859 4 10 (Increase)
General Loan Account	118,204 9 6	160,221 17 1	42,017 7 7 (Increase)
£	4,141,542 2 4	4,475,418 14 9	£333,876 12 5 (Increase)

EXPENDITURE FROM CONSOLIDATED REVENUE FUND

The following tabulation is a comparison of expenditure by the functional Divisions of the Department for the last two financial years :—

Division	1960-61	1961-62	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Central Administration	719,361 14 2	781,310 5 11	61,948 11 9 (Inc.)
Science Services	151,374 15 10	183,290 12 4	31,915 16 6 (Inc.)
Plant Industry	240,250 15 1	258,130 16 6	17,880 1 5 (Inc.)
Horticulture	209,117 2 2	234,198 6 2	25,081 4 0 (Inc.)
Dairying	212,856 1 8	230,910 19 2	18,054 17 6 (Inc.)
Hawkesbury Agricultural College	245,225 10 4	258,335 16 0	13,110 5 8 (Inc.)
Wagga Agricultural College	120,446 18 6	129,714 0 10	9,267 2 4 (Inc.)
Experiment Farms and Stations	425,144 18 5	442,490 0 3	17,345 1 10 (Inc.)
Animal Industry—			
Head and District Offices	540,773 12 11	624,907 13 7	84,134 0 8 (Inc.)
Queensland Border	85,770 1 11	84,919 14 3	850 7 8 (Dec.)
Tick Quarantine Areas	941,152 7 3	944,444 8 1	3,292 0 10 (Inc.)
Royal Botanic Gardens	131,863 14 7	142,544 4 7	10,680 10 0 (Inc.)
Totals £	4,023,337 12 10	4,315,196 17 8	291,859 4 10 (Inc.)

New awards and agreements completed during the currency of the year provided for increased rates of remuneration for almost the full staff of the Department. This accounts for the greater portion of the increased expenditure over all Divisions. The remainder is attributable to normal growth of the Departmental activities.

EXPENDITURE FROM GENERAL LOAN ACCOUNT

Expenditure from General Loan Account for the year was £160,221 17s. 1d., of this £95,510 9s. 11d. was spent on the new dormitory block at Wagga Agricultural College and £13,387 13s. 0d. on the new administration and laboratory block at Leeton Agricultural Research Station. Both undertakings are nearing completion.

OTHER ACCOUNTS

SPECIAL DEPOSITS ACCOUNT

Following is a complete list of accounts and funds within the Special Deposits Account at the Treasury on which this Department operates:—

Name of Account	Balance as at 1st July, 1961	Receipts 1961-62	Payments 1961-62	Balance as at 30th June, 1962
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Advances to Officers for Purchase of Motor Cars	*Dr.* 105,964 15 7	44,347 15 7	48,846 2 3	*Dr.* 110,463 2 3
Contribution towards Running Expenses of Tractor Mower at Centennial Park	204 16 6	.....	165 15 1	39 1 5
Potato Growers' Licensing Act, 1940	813 13 4	1,964 12 0	1,758 1 1	1,020 4 3
Balance of Salaries Adjustment Suspense Account	32,995 11 2	51,705 17 8	32,995 11 2	51,705 17 8
Commonwealth-State Flood Relief Scheme, 1961	.....	115,000 0 0	96,999 7 4	18,000 12 8
Government Printing Office—Working Account and Stores Account and Sale of Publications	.....	1,088 1 4	105 18 7	982 2 9
Noxious Insects Destruction Account	44,983 1 0	1,960 14 6	37,002 13 8	9,941 1 10
Swine Compensation Fund	54,280 9 4	102,794 6 7	127,538 8 3	29,536 7 8
Hawkesbury Agricultural College Canning Factory Account	1,058 11 5	2,611 17 7	1,749 12 0	1,920 17 0
Bush Fire and Flood Relief Account (State)	10,180 17 6	2,500 0 0	792 16 4	11,888 1 2
Hawkesbury Agricultural College—Dairying Factory Working Account	45,476 15 2	178,638 0 5	175,518 5 9	48,596 9 10
Tobacco Industry Trust Account	21,057 1 8	460 0 0	10,730 1 0	10,787 0 8
Pasture Control Account	8,221 10 8	1,819 16 9	.....	10,041 7 5
Unclaimed Moneys Account	787 15 8	449 9 2	364 15 10	872 9 0
Commonwealth Grant Towards the Promotion of Improved Practices in the Dairying Industry	8,874 7 11	65,126 2 5	66,805 1 4	7,195 9 0
Argentine Ant Eradication Campaign	1,301 0 10	.....	1,301 0 10	.....
Commonwealth Grant—Expansion of Agricultural Advisory Services—New South Wales	23,621 18 6	76,797 11 9	86,903 12 9	13,515 17 6
Cattle Compensation Fund	376,209 9 8	416,790 6 6	193,232 3 7	599,767 12 7
V. P. Bragg Scholarship—Wagga Agricultural College	57 4 8	307 10 0	215 0 0	149 14 8
Wagga Agricultural College Swimming Pool Account	342 17 0	578 10 10	6 13 4	914 14 6
V. P. Bragg Scholarship Account (Investment)	6,000 0 0	.....	.....	6,000 0 0
Wagga Agricultural College Swimming Pool Account (Investment Account)	5,500 0 0	.....	.....	5,500 0 0
Egg Marketing Board for the State of New South Wales—Triennial Elections, 1961	.....	.....	761 19 10	*Dr.* 761 19 10
Egg Marketing Board for the State of New South Wales—By-Election	1 13 7	.....	1 13 7	.....
Rice Marketing Board for the State of New South Wales—Triennial Elections	.....	115 13 3	115 13 3	.....
Rice Marketing Board for the State of New South Wales—By-Election for Producers' Representative	.....	.....	27 16 8	*Dr.* 27 16 8
Argentine Ant Eradication Campaign	*Dr.* 2,914 0 0	2,914 0 0	.....	.....
Additional Poultry Housing for Random Sample Tests at Hawkesbury Agricultural College	*Dr.* 3,700 0 0	528 11 5	640 0 0	*Dr.* 3,811 8 7
Swine Fever Outbreak—Payment of Compensation	.....	.....	50,000 0 0	*Dr.* 50,000 0 0
Hawkesbury Agricultural College Trust Account	4,612 2 6	8,710 8 1	7,709 3 11	5,613 6 8
Wagga Agricultural College Trust Account	1,527 6 3	2,035 0 9	2,113 2 4	1,449 4 8
Advertising—Department of Agriculture Publications Account	1,759 7 3	13,991 19 6	14,513 3 4	1,238 3 5
Australian Dairy Produce Board—Grant for Research Projects	4,452 1 0	17,721 6 8	16,538 12 5	5,634 15 3
Australian Turkey Federation—Contribution for Extensions of Facilities at Wagga Agricultural College Turkey Demonstration Centre	.....	250 0 0	.....	250 0 0
Board of Tick Control Employee's proportion of contributions to Local Government Superannuation Scheme	.....	6,442 2 4	.....	6,442 2 4
Brown Rot Investigations—Trust Fund	1,241 9 4	500 0 0	1,516 19 11	224 9 5
Commonwealth Contribution for Research into Control of Insecticidal Resistance in Sheep Blowfly	1,798 4 10	1,600 0 0	1,264 9 1	2,133 15 9
Commonwealth Contribution for Research into Control of Itch Mite in Sheep	2,312 2 11	1,000 0 0	2,312 16 7	999 6 4
Commonwealth Grant for Additional Sheep and Wool Advisory Officers	1,905 2 9	5,500 0 0	7,428 11 9	*Dr.* 23 9 0
Commonwealth Grant for Appointment of Wheat Geneticist at Wagga Agricultural Research Institute	24 12 9	1,800 0 0	1,626 17 5	197 15 4
Commonwealth Grant for Relief of Growers in the Tobacco Industry	.....	25,000 0 0	.....	25,000 0 0
Commonwealth Grant for the Development of a Rotary Sod-Seeder	400 0 0	.....	400 0 0	.....
Contribution by Commonwealth Towards Cost of Investigations into Excess Spray Residue on Fruit	504 6 2	3,271 0 0	2,786 0 2	989 6 0
Contributons by Geigy Agricultural Chemicals for Weedicide Research Project at Hawkesbury Agricultural College	.....	247 6 0	147 15 10	99 10 2
Contribution by Manning District Agricultural Research Council for Pasture Research in Manning District	1,051 11 9	800 0 0	1,569 15 6	281 16 3
Contribution by Legume Inoculant Association towards Research and Service in the Field of Rhizobiology	9 10 0	.....	6 15 6	2 14 6
Contributions by Industry towards Research into Meat Meal Quality at Seven Hills	.....	1,811 1 5	.....	1,811 1 5
Contributions by States towards Salary and Expenses of Patrol Officer	1,295 1 5	573 13 9	1,464 1 4	404 13 10
Contributions for Plague Locust Trial Control Campaign	36,107 6 9	.....	491 9 2	35,615 17 7

Special Deposits Account—*continued*

Name of Account	Balance as at 1st July, 1961	Receipts 1961-62	Payments 1961-62	Balance as at 30th June, 1962
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Contributions for Research in Agronomy—Hawkesbury Agricultural College	100 0 0	.....	100 0 0	.....
Contribution towards Animal Insect Pest Investigations—Glenfield Veterinary Research Station	521 13 11	.....	.....	521 13 11
Contributions towards Development of Tamworth Experiment Station	9,010 5 9	.....	7,942 4 5	1,068 1 4
Contributions to Pasture Research—Mid-Coast and Hunter Region	1,491 6 0	1,500 0 0	1,206 3 8	1,785 2 4
Contributions towards Establishment of Library at Agricultural Research Institute, Wagga	36 15 0	.....	10 3 6	26 11 6
Department of Agriculture Suspense Account	21,431 19 11	128,818 8 5	102,454 8 0	47,796 0 4
Donation by I.C.I.A.N.Z. towards Pasture Fertiliser Nitrogen Investigations	248 7 4	.....	.....	248 7 4
Exhibit at World Poultry Congress, 1962	.....	3,600 0 0	.....	3,600 0 0
Fire Damage Account	240 12 10	.....	.....	240 12 10
Grant by Wool Research Committee for Black Soil Scarab Investigations	319 9 7	1,200 0 0	1,083 15 6	435 14 1
Grant by Wool Research Committee for Co-operative Research into treatment of Non-arable Areas—Serrated Tussock Control	.....	3,200 0 0	2,003 13 0	1,196 7 0
Grant by Wool Research Committee—Efficiency of Wool Production and Influence of Season on Ram Fertility	736 0 0	3,295 0 0	2,899 13 1	1,131 6 11
Grant by Wool Research Committee for Research in Galvanised Burr Control	1,120 16 9	1,500 0 0	1,943 17 5	676 19 4
Grant by Wool Research Committee for Re-establishment of Shannon Vale Nutrition Station	.....	8,000 0 0	3,232 1 3	4,767 18 9
Hawkesbury Agricultural College Egg Laying Competition Prize Fund	2,076 15 10	1,748 13 0	2,754 8 11	1,070 19 11
Hawkesbury Agricultural College Swimming Pool	2,125 14 8	.....	782 11 2	1,343 3 6
Horse Breeding Fund	142 18 10	.....	.....	142 18 10
National Heart Campaign Appeal	54 6 2	1 7 0	55 13 2	.....
N.S.W. Wheat Industry Research Committee—Grant for expanded Wheat Research Projects, Wagga Agricultural Research Institute	1,821 18 6	6,000 0 0	8,839 15 7	*Dr.* 1,017 17 1
New South Wales Wheat Industry Research Committee Grant for Black Soil Scarab Investigations	1,002 13 5	.....	974 18 8	27 14 9
New South Wales Wheat Industry Research Committee Grant—Cropping Trial	.....	925 0 0	448 13 11	476 6 1
New South Wales Wheat Industry Research Committee Grant—Visit to New Zealand, K. H. Davey, Cereal Technician	.....	150 0 0	150 0 0	.....
New South Wales Wheat Industry Research Committee Grant to Agricultural Research Institute, Wagga—For Frost Resistance Investigations	5,346 3 9	.....	1,997 2 9	3,349 1 0
New South Wales Wheat Industry Research Committee Grant—Moisture Utilisation	.....	1,360 0 0	530 8 1	829 11 11
New South Wales Wheat Industry Research Committee Grant for Skeleton Weed Research	104 0 5	.....	82 17 5	21 3 0
New South Wales Wheat Industry Research Committee Grant—Soft Wheat Quality Programme—Central West	.....	1,500 0 0	20 10 0	1,479 10 0
New South Wales Wheat Industry Research Committee Grant—Soil Fertility	.....	5,810 0 0	3,498 16 5	2,311 3 7
New South Wales Wheat Industry Research Committee Grant—Wheat Granularity	.....	500 0 0	362 16 5	137 3 7
New South Wales Wheat Industry Research Committee Grant—Wheat Yield	.....	300 0 0	101 2 8	198 17 4
Pastures Protection Boards of New South Wales—Subsidy to Glenfield Veterinary Research Station	83 8 4	.....	83 8 4	.....
W. S. Pender Memorial Fund—Interest on Bonds	117 9 0	41 15 0	53 2 6	106 1 6
Rice Research Laboratory, Yanco	286 0 0	.....	.....	286 0 0
Shannon Vale Nutrition Station Working Account	3,885 2 4	4,438 1 8	3,613 9 6	4,709 14 6
Tropical Fruit Research Station	4,218 9 11	.....	1,069 1 6	3,149 8 5
Unclaimed Salaries and Wages	522 16 2	1,933 3 7	1,902 4 11	553 14 10
Wheat Industry Research Council Grant for Investigation into Possibilities of Segregation of Wheats on the Basis of Quality	492 16 10	2,500 0 0	2,281 14 2	711 2 8
Wheat Industry Research Council—Grant for Wheat Root Rot Publication	.....	550 0 0	498 15 7	51 4 5
£	645,928 6 11	1,338,624 4 11	1,149,445 9 3	835,107 2 7

Brief details of the legislation covering some of the more important aspects of these accounts, together with short histories of the operations conducted under each of them, were given in the Annual Report for 1957-58.

The following additional information is now offered in respect of such of the accounts as appear to warrant further amplification:—

Swine Compensation Fund

	£ s. d.	
Balance at 1st July, 1961	54,280 9 4	
Receipts—		
Stamp Duty	52,794 6 7	
	107,074 15 11	
Disbursements—		
Swine Compensation	127,538 8 3	
Balance as at 30th June, 1962	(a)£20,463 12 4	*Dr.*

(*a*) An amount of £50,000 was advanced by the State Treasury to enable payment of compensation to be made in excess of the amount available in the Fund. After deduction of the debit balance of £20,463 12s. 4d. on the Fund at 30th June, 1962, there remained £29,536 7s. 8d. of the special advance to meet further claims. It is to be noted that the full £50,000 advance is repayable to the State Treasury.

Income from Stamp Duty rose by £36,372 6s. 5d. as compared with 1960-61, i.e., from £16,422 0s. 2d. to £52,794 6s. 7d. This is due to the increase in Stamp Duty from 6d. to 2s., which has operated from October, 1961, following the outbreak of Swine Fever.

The increased rate of income from Stamp Duty was not sufficient to maintain the account until disbursements began to fall from January, 1962, since when the Fund has continued to steadily increase.

Compensation amounting to £142,772 18s. 3d. has been paid in respect of Swine Fever condemnations since the commencement of the outbreak in May, 1961.

Cattle Compensation Act, 1951 (as amended)

Disease	Claims			Animals			Payments		
	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total
							£ s. d.	£ s. d.	£ s. d.
Tuberculosis	1,372	762	2,134	4,223	1,532	5,755	65,559 14 2	37,185 10 3	102,745 4 5
Cancer	2,259	234	2,493	3,102	323	3,425	37,642 0 10	6,300 5 5	43,942 6 3
Actinomycosis	1,597	11	1,608	1,918	12	1,930	22,406 7 2	154 16 5	22,561 3 7
Actinobacillosis	495	4	499	562	4	566	6,359 19 6	47 11 7	6,407 11 1
Pleuro Pneumonia Contagiosa	4	..	4	4	..	4	105 0 0	....	105 0 0
Trichomoniasis	5	..	5	5	..	5	54 10 8	....	54 10 8
Tick Fever	..	..	..	..	..	..	....	....	....
Johne's Disease	5	..	5	8	..	8	173 7 7	....	173 7 7
Vibriosis	..	..	..	..	..	..	....	....	....
Totals	5,737	1,011	6,748	9,822	1,871	11,693	£132,300 19 11	43,688 3 8	
Net Compensation paid									£175,989 3 7

SUMMARY OF RECEIPTS AND PAYMENTS

	£ s. d.	£ s. d.	£ s. d.
Balance of Fund as at 1st July, 1961	.....	.....	376,209 9 8
Add Receipts—			
Levy	307,238 19 1		
Less Refunds	2,814 15 0		
		304,424 4 1	
Sale of Stamps		112,366 2 5	
Recovery from deceased estate		16 0 0	
			416,806 6 6
			793,015 16 2
Deduct Payments—			
Compensation		175,989 3 7	
Administration Costs—			
Legal Costs	5 3 0		
Valuation Fee	2 2 0		
Pastures Protection Boards Secretaries' Allowances (1st January, 1961, to 31st December, 1961)	2,125 0 0		
Department of Agriculture	15,126 15 0		
		17,259 0 0	
			193,248 3 7
Balance of Fund at 30th June, 1962	.....	.....	599,767 12 7

Commonwealth Dairy Industry Extension Grant

The continuance of this grant has been approved to 30th June, 1963, under the terms and conditions set out in the Department's report for the year ended 30th June, 1953.

The first grant was received in October, 1948, and the expenditure to 30th June, 1962, amounted to £891,877 9s. 6d. under the following headings :—

Item	1948-49 to 1960-61	1961-62	Total
	£ s. d.	£ s. d.	£ s. d.
Organising Officers	144,561 18 7	9,458 12 8	154,020 11 3
General Publicity	78,699 8 11	7,345 10 10	86,044 19 9
Demonstrations	164,415 19 5	4,743 12 7	169,159 12 0
Competitions	7,437 7 4	....	7,437 7 4
Field Days	88 15 7	....	88 15 7
Herd Recording	242,783 17 10	25,950 0 0	268,733 17 10
Artificial Insemination	60,075 15 3	....	60,075 15 3
Statistical Work	18,034 1 9	....	18,034 1 9
Herd Surveys	26,165 6 8	....	26,165 6 8
Punch Card Equipment	26,300 15 11	2,560 9 11	28,861 5 10
Milking Machine Survey	21,775 6 6	8,853 2 1	30,628 8 7
Contribution towards attendance of representative at International Study Centre	400 0 0	....	400 0 0
Contribution towards attendance of representative at Maryland University	806 16 3	....	806 16 3
Milking Machine Testing Station	4,882 14 5	....	4,882 14 5
Survey—Infertility in Dairy Herds	7,076 4 10	2,751 3 4	9,827 8 2
Agricultural Trainees	16,000 0 0	4,000 0 0	20,000 0 0
Sire Survey	1,433 0 0	1,036 9 11	2,469 9 11
Overseas Visit of Senior Women's Extension Service Officer	1,127 13 11	....	1,127 13 11
Testing Stations—Air-flow Meters	7 5 0	106 0 0	113 5 0
Publication of Book "Weeds"	3,000 0 0	....	3,000 0 0
£	825,072 8 2	66,805 1 4	891,877 9 6

Commonwealth Grant—Expansion of Agricultural Advisory Services—N.S.W.

The Commonwealth agreed to make grants to the States to permit of the expansion of the Agricultural Advisory Services. Initially the grants were for a five year period ended 30th June, 1957. They have been continued and the current agreement will terminate on 30th June, 1965.

Expenditure to 30th June, 1962, amounted to £608,475 3s. 3d. under the following headings:—

Item	1952-53 to 1960-61	1961-62	Total
	£ s. d.	£ s. d.	£ s. d.
Crop and Pasture Demonstrations	89,213 16 1	1,562 9 4	90,776 5 5
Livestock Demonstrations	25,352 9 0	2,222 16 9	27,575 5 9
Horticultural Demonstrations	13,061 7 8	1,928 11 7	14,989 19 3
Agricultural Machinery Demonstrations	20,762 17 4	2,777 9 6	23,540 6 10
Irrigation Equipment and Demonstrations	1,100 16 5	....	1,100 16 5
Field Assistants and Motor Vehicles	164,164 4 5	32,364 12 2	196,528 16 7
Extension Aid Equipment	37,103 16 5	8,615 13 10	45,719 10 3
Publicity Officers	66,294 19 0	17,799 0 0	84,093 19 0
Production of Agricultural Publications	27,602 2 9	4,805 0 6	32,407 3 3
Production of Agricultural Films	2,870 17 1	....	2,870 17 1
Purchase of Books	7,690 18 5	1,220 10 2	8,911 8 7
Overseas Visits of Agricultural Officers	8,861 5 8	30 10 9	8,891 16 5
Agricultural Trainees and Cadets	50,393 3 5	11,155 15 9	61,548 19 2
Administration	6,945 4 4	1,091 18 2	8,037 2 6
Water and Soil Testing	153 12 6	1,329 4 3	1,482 16 9
Totals £	521,571 10 6	86,903 12 9	608,475 3 3

Noxious Insects Destruction Account

The Noxious Insects Act of 1934 provides for the striking of a levy under specified conditions, as a contribution towards the cost of suppression and destruction of noxious insects. The revenue is paid into Special Deposits Account and moneys at the credit of this Account are applied by the Minister for the purposes prescribed in the Act.

No levies were struck during the 1961 calendar year, nor has any levy been struck to 30th June, 1962. Levies received during the financial year ended 30th June, 1962, were arrears for the 1961 calendar year. A campaign against outbreak of plague locusts was conducted during the spring and summer of 1961 in the area surrounding the lower part of the Macquarie River, extending from the Bogan River on the west to the Castlereagh River on the east, and from Carinda in the north to Peak Hill in the south.

Following is a Statement of Receipts and Payments for the year 1961-62:—

Receipts	£ s. d.	£ s. d.
Balance as at 1st July, 1961	44,983 1 0	
Sale of Materials	60 0 0	
Compensation paid by Department of Railways	7 0 0	
Levies	1,797 19 8	
Payments		
Poison and Materials	34,716 13 1	
Less Refund on Drums	92 0 0	
		34,624 13 1
Maintenance of Motor Vehicles		178 2 8
Payroll Tax 1960-61		1 12 11
Cartage		108 18 6
Aeroplane Hire		1,678 10 0
Telephone		1 6 8
Wages		302 10 0
Advertising		11 5 0
Balance at 30th June, 1962		9,941 1 10
	£46,848 0 8	£46,848 0 8

Pastures Protection Boards of New South Wales—Subsidy to Glenfield Veterinary Research Station

This subsidy was withdrawn as from 1st July, 1961, by mutual agreement between the Pastures Protection Boards' Council of Advice and the Department. The credit balance at 1st July, 1961, was £83 8s. 4d. Payment of Payroll Tax for 1960-61 accounted for £61 9s. 9d. and the remaining £21 18s. 7d. was refunded to the Council of Advice.

Potato Growers' Licensing Act, 1940 (as amended)

Transactions on this Account for the year 1961-62 were:—

Receipts	£ s. d.	Payments	£ s. d.
Balance as at 1st July, 1961	813 13 4	Grants to Potato Growers' Association	1,600 0 0
Licence Fees	1,964 12 0	Printing and Stationery	32 9 9
		Postage	40 3 4
		Issue of Licences	85 8 0
		Balance as at 30th June, 1962	1,020 4 3
	£2,778 5 4		£2,778 5 4

Shannon Vale Nutrition Station—Working Account

Statement of Receipts and Payments for the year ended 30th June, 1962:—

Receipts	£ s. d.	£ s. d.	Payments	£ s. d.
Balance as at 1st July, 1961	.....	3,885 2 4	Wages	1,292 18 3
Sale of Wool	3,850 2 10		Workers' Compensation Insurance	29 19 6
Sale of Livestock	507 12 9		Payroll Tax, 1960-61	33 16 9
Sale of Skins	36 17 2		Buildings, Fencing and Repairs	382 2 8
		4,394 12 9	Freight and Cartage	214 0 11
Rent of Cottage		43 8 11	Motor Spirit	76 10 4
			Vaccine Supplies and Drenches	346 4 9
			Fertilizers	651 15 0
			General Supplies	288 15 10
			Insurance on Tractor—Comprehensive and Third Party	8 4 7
			Plant Maintenance and Repairs	289 0 11
			Balance as at 30th June, 1962	4,709 14 6
		£8,323 4 0		£8,323 4 0

OTHER ACCOUNTS

Contribution by Milk Board to meet cost of Herd Testing for Tuberculosis

Although these operations are within the framework of the Consolidated Revenue Fund, separate accounts are kept in the Department to show the annual financial result. Following is a Statement of Receipts and Payments for the year ended 30th June, 1962, in respect of this service:—

Receipts	£ s. d.	Payments	£ s. d.
Contributions by Milk Board	5,502 8 0	Balance at 1st July, 1961 (payable by Milk Board)	502 8 0
		Salaries	4,023 17 8
		Employer's Proportion of Superannuation Contributions	296 1 10
		Workers' Compensation Insurance Premiums	79 14 3
		Payroll Tax	106 10 5
		Travelling Expenses	236 17 5
		Postages	4 3 4
		Printing	21 3 0
		Balance at 30th June, 1962 (Representing Amount over-contributed by Milk Board)	231 12 1
	£5,502 8 0		£5,502 8 0

Veterinary Surgeons' Act, No. 25 of 1923

The Act provides for the establishment of a Board to be called " Board of Veterinary Surgeons of New South Wales ". Fees and penalties collected under the Act are paid to the credit of Consolidated Revenue Fund, from which administrative expenses are met. There were 451 registered Veterinary Surgeons at 30th June, 1962.

Receipts and Payments for the financial year 1961-62 were:—

Receipts	£ s. d.	Payments	£ s. d.
Registration Fees	27 6 0	Salaries	692 19 11
Restoration Fees	15 15 0	Members' Fees	105 0 0
Roll Fees	927 17 2	Travelling Expenses	9 7 6
Examination Fees	42 0 0	Postage	32 14 3
		Printing	82 11 3
		Fees for examination of Foreign Graduates	63 0 0
		Excess of Receipts and Payments	27 5 3
	£1,012 18 2		£1,012 18 2

Meat Inspection Service

This service is administered under the Meat Industry Act, 1915, as amended, which makes provision for inspection fees. Prior to 1st July, 1961, the actual cost of the Meat Inspection Service at the State Abattoir, Homebush Bay, was recouped to the Department by the Metropolitan Meat Industry Board. Suitable amendment was made to the Act, so that on and from 1st July, 1961, the Metropolitan Meat Industry Board paid fees for meat inspection at its Homebush Bay Abattoir in lieu of the previous practice, thus making the method of collection uniform.

Meat Inspection fees were raised by 20 per cent from 1st December, 1961.

Following is a statement of receipts and payments of the Meat Inspection Service for the year ended 30th June, 1962:—

Receipts	£ s. d.	Payments	£ s. d.
Inspection Fees—		Salaries and Wages	247,332 9 6
Regulation No. 7	137,329 10 2	Casual Labour	4,000 13 2
Regulation No. 8	31,628 2 10	Retirement Leave Payments	1,061 0 5
Regulation No. 9	84,077 11 1	Metropolitan Meat Industry Board Officers' Endowment Fund Contribution	3,164 3 1
Regulation No. 10	488 0 8	Travelling Expenses	16,452 1 4
Contributions from Metropolitan Meat Industry Board, &c.	24,460 10 5	Freight and Cartage	30 9 4
		Postal and Telephone	451 17 11
		General Stores	1,546 1 7
		Gas and Electricity	6 6 9
		Rent	559 9 9
		Surplus of Receipts over Payments	3,379 2 4
	£277,983 15 2		£277,983 15 2

Whilst there was a surplus of receipts over payments amounting to £3,379 2s. 4d. for the year ended 30th June, 1962, the sum of £22,454 19s. 7d. received from the Metropolitan Meat Industry Board in respect of the cost of Meat Inspection Services at the State Abattoir for 1960-61 was included in the receipts of Inspection Fees. In addition overhead expenses of £50,266 12s. 6d. (including Employer's Superannuation Contribution, Workers' Compensation Insurance and Payroll Tax, calculated at 20 per cent of cost of salaries and wages—£251,333 2s. 8d.) have not been taken into account in the 1961-62 statement.

The table hereunder demonstrates the effect these two considerations have on the 1961-62 statement:—

	£ s. d	£ s. d.
Surplus of receipts over payments		3,379 2 4
Less—		
Payment by Metropolitan Meat Industry Board in respect of 1960-61 inspection	22,454 19 7	
Overhead expenses 1961-62 to be provided for	50,266 12 6	
		72,721 12 1
Deficiency		£69,342 9 9

Fund Created by the Wheat Marketing (Barring of Claims) Act of 1929 (as amended)

REVENUE ACCOUNT FOR THE YEAR ENDED 30TH JUNE, 1962

	£ s. d.		£ s. d.
To Miscellaneous Disbursements	595 0 0	By Interest on Investments	1,960 8 11
Commitments	684 0 0		
Balance—Net Surplus transferred to Accumulated Funds Account	681 8 11		
	£1,960 8 11		£1,960 8 11

BALANCE SHEET AS AT 30TH JUNE, 1962

LIABILITIES	£ s. d.	£ s. d.	ASSETS	£ s. d.
Accumulated Funds—			Investments in Government Securities (face value)	45,070 0 0
Balance as at 1st July, 1961	45,496 12 5		Balance at Savings Bank	1,279 3 0
Net surplus for year ended 30th June, 1962	681 8 11		Interest accrued to 30th June, 1962	512 18 4
		46,178 1 4		
Commitments at 30th June, 1962		684 0 0		
		£46,862 1 4		£46,862 1 4

STATEMENT OF RECEIPTS—CONSOLIDATED REVENUE FUND—FINANCIAL YEAR 1961-62

Head of Receipt	£ s. d.	£ s. d.	£ s. d.
Receipts for Services Rendered—			
Agricultural Colleges and Farms—			
Rents	26,203 17 5		
Students' Fees	48,085 18 10		
		74,289 16 3	
Fees—			
Public Officers	86 15 1		
Apiary Registrations	2,968 6 11		
Cattle Export	68 18 0		
Grading—Dairy Industry Act	3 19 9		
Licence—Dairy Industry Act	16 0 0		
Registration—Dairy Industry Act	7 10 0		
Dairy Science Schools	179 0 6		
Farm Produce Agents' Act, 1926-1932	295 1 0		
Fertilizer Act, 1934	262 10 0		
Pest Destroyers Act, 1945	647 1 0		
Registration of Stock Brands	1,329 14 8		
Registration of Swine Brands	393 3 0		
Stock Foods and Medicines Act, 1940	1,169 17 6		
Veterinary Surgeons' Act, 1923	1,012 18 2		
		8,440 15 7	
Contributions—			
Milk Board—T.B. Testing of Herds	5,502 8 0		
Commonwealth Government—Administration of Plant Quarantine	35,062 14 4		
Commonwealth Government—Administration of Animal Quarantine	18,509 18 6		
Commonwealth Government—Administration of Commerce Act	20,842 17 1		
Commonwealth Government—Maintenance of Gardens at Admiralty House	6,966 13 11		
		86,884 11 10	

Statement of Receipts—Consolidated Revenue Fund—Financial Year 1961-62—*continued*

Head of Receipt	Net Receipts		
	£ s. d.	£ s. d.	£ s. d.
Receipts for Services Rendered—*continued*—			
Miscellaneous Services Rendered—			
Plant Diseases Act—Inspection Fees	4,486 0 9		
Plant Diseases Act—Fumigation Fees	49 15 3		
Inspection Fees—Meat Industry Act	277,983 15 2		
Commonwealth Scientific and Industrial Research Organisation Subsidy—Vegetable growing at Hawkesbury Agricultural College	500 0 0		
Laundry Fees—Hawkesbury Agricultural College	3,221 15 4		
Analyses	63 19 6		
Certification of—			
Seed	5,521 1 6		
Bean Seed	524 4 6		
Hybrid Sorghum Seed	30 10 0		
Seed Potatoes	1,140 8 4		
Sorghum Almum	848 17 6		
Sweet Sorghum	186 15 0		
Chicken Sexing Examinations	1 1 0		
Random Sample Test—Turkeys	10 0 0		
Dipping Stock	4,583 18 0		
Flour Certificates	277 11 6		
Fumigation	8 14 6		
Herd Recording	51,584 4 4		
Honey Certificates	48 3 0		
Piroplasmosis Testing of Bulls	9 19 6		
Pullorum Testing of Fowls	2 0 0		
Registration of Hybrid Seed Maize	2,004 12 0		
Seed Testing	462 1 6		
Testing Air Flow Meters	13 13 0		
T.B. Testing of Cattle	70 3 0		
Administration of Cattle Compensation Fund	15,126 15 0		
Commission for Collection of Premiums—Group Assurance Hospitals and Medical Funds	1,253 8 4		
Other Miscellaneous Receipts	16 0		
		370,014 3 6	
			539,629 7 2
General Miscellaneous Receipts—			
Rents exclusive of Land	2,025 11 4		
Fines and Forfeitures—Forfeiture of Bonds, &c.	3,754 2 10		
Sales of Farm Produce—Farms and Institutions	146,453 7 3		
Sale of Government Property	1,370 17 9		
Commonwealth Government—Contribution in respect of Cattle Tick Eradication	311,803 13 2		
Repayments to credit of Consolidated Revenue Votes—Previous Years	17,906 0 8		
Miscellaneous Receipts on Account of Interest	117 18 7		
Transfer of Part Balances not required	410 5 11		
Licence Fees—Pastures Protection Act	1,058 15 0		
Broadcasting Fees	5 6 9		
Gas and Electricity	2,920 7 1		
Lavatory Takings	91 12 6		
Postages	86 6 10		
Telephone Calls (private)	797 15 9		
Exchange on Remittances	269 3 0		
3% Contribution—Pastures Protection Boards	24,583 6 1		
Employer's Liability to State Superannuation Fund	4,700 14 7		
Commonwealth Grant towards Cost of Herd Recording	25,950 0 0		
Other Miscellaneous Receipts	1		
			544,305 5 2
Total Net Receipts £	.....	.....	1,083,934 12 4

EXPENDITURE FROM CONSOLIDATED REVENUE FUND AND GENERAL LOAN ACCOUNT—1961-62

(See separate Statement of Expenditure from Special Deposits Account)

Section	Consolidated Revenue Fund				General Loan Account
	Salaries and Payments in the Nature of Salary	Maintenance and Working Expenses Other than Salaries	Other Services	Total	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Central Administration	603,036 1 11	104,515 8 9	73,758 15 3	781,310 5 11	....
Division of Science Services	160,980 2 4	17,627 7 6	4,683 2 6	183,290 12 4	....
Division of Plant Industry	213,268 10 4	37,468 8 0	7,393 18 2	258,130 16 6	....
Division of Horticulture—					
Fruit	142,356 13 4	21,923 6 7	9,094 13 2	173,374 13 1	....
Export and Import Branch	20,492 13 9	2,081 3 10	1,950 0 0	24,523 17 7	....
Plant Quarantine Service	33,912 16 8	2,386 18 10	....	36,299 15 6	....
Division of Dairying—					
General	95,370 17 10	15,500 18 0	298 3 10	111,169 19 8	....
Herd Recording	91,423 14 6	27,337 16 9	979 8 3	119,740 19 6	....
Hawkesbury Agricultural College	157,601 14 3	80,608 0 4	20,126 1 5	258,335 16 0	6,832 14 2
Wagga Agricultural College	82,902 0 8	38,759 8 11	8,052 11 3	129,714 0 10	99,978 2 4
Experiment Farms and Stations Branch	....	5 8 2	....	5 8 2	....
Alstonville Tropical Fruit Research Station	4,978 0 11	3,069 5 4	371 15 1	8,419 1 4	4,962 8 0
Bathurst Experiment Farm	16,428 14 1	5,212 5 4	2,753 15 1	24,394 14 6	....
Condobolin Experiment Farm	13,048 11 6	9,692 11 11	898 12 6	23,639 15 11	1,325 0 0
Cowra Experiment Farm	9,820 5 4	3,027 10 8	1,133 1 6	13,980 17 6	....
Dareton Horticultural Research Station (*a*)	2,891 10 7	2,912 16 8	179 12 9	5,984 0 0	3,293 17 8
Glen Innes Agricultural Research Station (*b*)	21,954 4 6	5,179 3 6	319 18 3	27,453 6 3	....
Grafton Experiment Farm	31,986 12 5	10,530 18 10	769 3 11	43,286 15 2	....
Griffith Viticultural Research Station (*c*)	2,709 5 5	3,757 16 10	635 13 1	7,102 15 4	....
Leeton Agricultural Research Station (*d*)	20,891 1 9	12,400 0 5	6,658 7 1	39,949 9 3	13,387 13 0
Narara Horticultural Research Station (*e*)	17,715 0 2	3,766 14 4	1,413 8 4	22,895 2 10	4,807 9 11
Narrabri Experiment Farm	7,674 14 8	4,374 17 6	2,634 11 4	14,684 3 6	2,550 0 0
Seven Hills Poultry Research Station	18,482 7 5	10,326 12 3	810 14 11	29,619 14 7	....
Tamworth Agricultural Research Station	9,462 16 5	6,006 13 5	1,225 12 7	16,695 2 5	1,232 19 2
Temora Experiment Farm	14,141 2 4	5,001 9 11	1,128 17 2	20,271 9 5	....
Trangie Agricultural Research Station	24,621 1 6	16,984 19 6	2,134 4 6	43,740 5 6	10,419 5 9
Wollongbar Agricultural Research Station	18,419 4 2	8,190 10 10	2,116 7 9	28,726 2 9	3,087 1 8
Yanco Agricultural Research Station	43,720 6 1	17,834 12 0	7,836 17 9	69,391 15 10	8,345 5 5
Tobacco Research	....	....	2,250 0 0	2,250 0 0	....
Division of Animal Industry—					
Head and District Offices	201,845 1 0	47,607 10 2	6,795 6 7	256,247 17 9	....
Glenfield Veterinary Research Station	58,206 0 0	16,653 2 3	1,631 11 11	76,490 14 2	....
Meat Inspection Service (*f*)	248,393 9 11	21,651 0 0	4,000 13 2	274,045 3 1	....
Animal Quarantine Service	17,101 3 5	1,022 15 2	....	18,123 18 7	....
Queensland Border	63,217 19 11	19,751 14 4	1,950 0 0	84,919 14 3	....
Tick Quarantine Areas	586,031 17 11	280,059 3 1	78,353 7 1	944,444 8 1	....
Royal Botanic Gardens and Allied Activities	130,424 0 5	7,394 16 3	4,725 7 11	142,544 4 7	....
Totals £	3,185,509 17 5	870,623 6 2	259,063 14 1	4,315,196 17 8	160,221 17 1

	£ s. d.	£ s. d.
Total Expenditure by Department of Agriculture		4,475,418 14 9
Expenditure by other Departments on behalf of the Department of Agriculture—		
Government Stores Department—		
Stores, Stationery, Furniture, &c.	36,485 8 9	
Cleaning Services	36,379 4 0	
		72,864 12 9
Government Printer		59,578 19 1
Government Real Estate Office		9,443 2 4
Department of Public Works—		
Gas and Electricity	28,927 11 7	
Maintenance of Buildings	36,357 19 6	
Telephones	31,997 5 3	
Public Buildings—Loan Vote	88,944 1 2	
		186,226 17 6
Total Expenditure by and on Behalf of the Department of Agriculture		£4,803,532 6 5

(*a*) Previously Lower Murray Research Station. (*b*) Previously New England Agricultural Research Station. (*c*) Previously Griffith Viticultural Nursery.
(*d*) Previously Leeton Experiment Farm. (*e*) Previously Narara Citrus Experiment Station. (*f*) Previously dissected under three headings.

APPENDIX II

Published Matter*, 1961-62

*Viz.:—Matter printed as Department of Agriculture (D. of A.) booklets, or contributed to and printed as articles either in Department of Agriculture journals (the monthly *Agricultural Gazette of N.S.W.*, quarterly *Review of Marketing and Agricultural Economics*, bi-monthly *Dairy Topics*) or the journals of other institutions/organisations; and papers presented to technical conferences.

The Appendix does not list numerically the many times greater volume of items contributed, in the course of extension work, to media such as the Department's weekly printed broadsheet, *Press Copy*, or in regional/district publicity releases for newspapers and radio stations. Indications of the volume of this published matter are included in this report under " Division of Information Services—Editorial Section, and Radio Section " and " Regional Extension Services—Regional Publicity ".

A. EXPERIMENT FARMS AND STATIONS BRANCH—FARM MECHANISATION ADVISORY SERVICE

D. of A. Booklets

Drever, J. G. J. (1961)—Farm Accidents—Cause and Prevention. 1st ed. 11pp.

Drever, J. G. J.—Tractor testing. 1st. ed. 8pp.

Drever, J. G. J.—What horse-power is it? 1st ed. 7pp.

Contributions to Journals

Drever, J. G. J. (1961)—Farm marchinery workshop and storage building. Agric. Gaz., N.S.W., 72 (10): 509-13.

Drever, J. G. J. (1962)—The hydraulic ram. Agric. Gaz., N.S.W., 73 (3): 113, 146-8.

Drever, J. G. J. (1962)—Tools and equipment for farm workshop. Agric. Gaz., N.S.W., 73 (1): 8-9, 41-4

Drever, J. G. J. (1962)—Will you be one of the 50 killed . . .? Agric. Gaz., N.S.W., 73 (6): 306-7.

Drever, J. G. J. and Gray, C. H. (Biom. Br.) (1961)—Solar water heaters tested on north coast farms. Agric. Gaz., N.S.W., 72 (12): 622-3, 661.

Book

Drever, J. G. J., Buxton, R. A. and Malcolm, R. T.—Contributions to "Know your tractor" (Australian Council of Young Farmers' Clubs and Ampol Petroleum Ltd.). 60pp. ill.

B. DIVISION OF PLANT INDUSTRY

D. of A. Booklets

Anon.—Cauliflower growing. 1st ed. 14pp.

Anon.—Control of kikuyu grass. 1st ed. 1p.

Anon.—Control of nut grass, onion weed, oxalis. 2nd ed. 2pp.

Anon.—Crofton weed. 1st ed. 1p.

Anon.—Cucumber growing. 5th ed. 6 pp.

Anon.—Growing capsicums (pepper). 2nd ed. 10pp.

Anon.—Lantana. 1st ed. 1pp.

Anon.—Liming materials. 2nd ed. 4pp.

Anon.—Long-styled feather grass. 1st ed. 1p.

Anon.—Mexican poppy. 1st ed. 1p.

Anon.—Nut grass control. 1st ed. 1p.

Anon.—Parnsnip growing. 2nd ed. 3pp.

Anon.—Paspalum control. 1st ed. 1p.

Anon.—Paterson's Curse. 1st ed. 1p.

Anon.—Pumpkin growing. 5th ed. 4pp.

Anon.—Rhubarb growing. 3rd ed. 3pp.

Anon.—St. John's wort. 1st ed. 2pp.

Anon.—Tomato culture. 6th ed. 22pp.

Anon.—Tree of heaven. 1st ed. 1p.

Anon.—Vegetable growing guide. 2nd ed. 15pp.

Anon.—Weed control for the home garden. 3rd ed. 2pp.

Campbell, M. H.—Identification of serrated tussock. 1st ed. 13pp.

Campbell, M. H.—Serrated tussock control. 1st ed. 15pp.

Colman, R. L. and Wilson, G. P. M.—The effect of floods on pasture plants. 1st ed. 11pp.

Dann, P. R.—Pastures for the south west wheat belt. 1st ed. 12pp.

Green, K. R.—Amitrol. 1st ed. 1p.

Green, K. R.—Chemical control of blackberries. 1st ed. 2pp.

Green, K. R.—Khaki weed. 1st ed. 2pp.

Green, K. R.—Tree or wild tobacco. 1st ed. 1p.

Green, K. R.—Vapam—Soil fumigant for weed control. 1st ed. 1p.

Green, K. R.—Water hyacinth. 1st ed. 1p.

Hall, B. J.—Chemical weed control in vineyards. 1st ed. 6pp. (In conjunction with Division of Horticulture.)

Hall, B. J.—Controlling weeds in pastures. 1st ed. 12pp.

Kavanagh, L. R.—Cultivation of cowpeas. 2nd ed. 8pp.

Kavanagh, L. R.—Maize growing in N.S.W. 2nd ed. 35pp.

Macadam, A. C. and Colman, R. L.—Vetches on north coast dairy farms. 1st ed. 4pp.

Shelley, R. W.—Heavy soils for wheat growing. 3rd ed. 8pp.

Spencer, R. T. and Tindale, E.—Production of field beans. 2nd ed. 9pp.

Squire, M. J. E.—Making good silage. 2nd ed. 45pp.

Strang, J.—Kangaroo Valley perennial ryegrass. 1st ed. 4pp.

Contributions to Journals

Anon (1962)—Change in wheat stem rust position. Agric. Gaz., N.S.W., 73 (4): 196.

Boyle, J. W. (1961)—Certified seed of sorghum almum now available. Agric. Gaz., N.S.W., 72 (10): 518-9.

Boyle, A. J. (1961)—Lucerne seed production. Agric. Gaz., N.S.W., 72 (12): 624-6, 655-8.

Boyle, A. J. (1961).—Sorghum almum popular in north west. Agric. Gaz., N.S.W., 72 (7): 338-44, 379.

Campbell, M. H. (1961).—Control of barley grass with chemicals. Agric. Gaz., N.S.W., 72 (11): 575-80.

Campbell, M. H. and Annand, A. M. (Union Carbide Aust. Ltd.) (1962).—The effect of herbicides and burning treatments in killing serrated tussock (*Nassella trichotoma* (Nees) Hack.). Aust. J. Exp. Agric. An. Husb. 2: 35-9.

Campbell, M. H. and Barkus, B. (Chem. Br.) (1961).—The effect of fertilisers on the crude protein content and palatability of serrated tussock (*Nassella trichotoma* (Nees) Hack.). Aust. J. Exp. Agric. An. Husb. 1: 92-4.

Cutting, F. W. (1962).—Better silage is in the making. Dairy Topics. 7 (3): 3-7.

Dann, P. R. (1962).—Lucerne can suppress phalaris. Agric. Gaz. N.S.W. 73 (3): 120-1, 124.

Dann, P. R. (1961).—Subterranean clover under irrigation at Yanco—Bacchus Marsh and Clare outyield Mt. Barker. Agric. Gaz. N.S.W. 72 (11): 592-4, 601.

Evans, D. C. (1962).—Buffel grass is doing well in south-west trials. Agric. Gaz. N.S.W. 73 (5): 230-2.

Evans, D. C. (1962).—What about broomrape? Agric. Gaz. N.S.W. 73 (4): 200-2.

Filan, F. F. (1962).—Lucerne, "King of Fodders". Agric. Gaz. N.S.W. 73 (6): 295-9.

Filan, F. F. (1961).—Production of perennial ryegrass seed. Agric. Gaz. N.S.W. 72 (10): 534-6, 550.

Filan, F. F. (1961).—Production of white clover seed. Agric. Gaz. N.S.W. 72 (11): 561-3, 583.

Fitzsimmons, R. W. (1961).—Disease and frost damage in cereals, 1960-61 season. Agric. Gaz. N.S.W. 72 (11): 581-3.

Fitzsimmons, R. W. (1962).—Wheat and oat variety trials. Agric. Gaz. N.S.W. 73 (6): 321-7.

Gottl, R. (1961).—The effect of gibberellic acid on tomatoes. Aust. Veg. Res. Newsl. No. 4: 40-1.

Gottl, R. (1961).—Trials with selective Gametocide FW-450 on tomatoes. Aust. Veg. Res. Newsl. No. 4: 36-8.

Green, K. R. (1962).—Mexican poppy. Agric. Gaz. N.S.W. 73 (6): 319-20.

Green, K. R. (1961).—St. John's wort is spreading. Agric. Gaz. N.S.W. 72 (9): 484-6.

Green, K. R. (1962).—Spiny burr grass. Agric. Gaz. N.S.W. 73 (2): 68-9.

Hall, B. J. (1962).—Controlling weeds in lettuce and beetroot. Agric. Gaz. N.S.W. 73 (5): 242-3, 245.

Hall, B. J. (1962).—Fewer weeds, more peas. Agric. Gaz. N.S.W. 73 (1): 15-7.

Hall, B. J. (1961).—How much herbicide should I use? Agric. Gaz. N.S.W. 72 (11): 595-7.

Hall, B. J. (1961).—Two new chemicals for weed control in vegetables and maize. Agric. Gaz. N.S.W. 72 (8): 393-8.

Hoskins, D. C. (1961).—The methods used at Bathurst Experiment Farm to produce hybrid cauliflower seed. Aust. Veg. Res. Newsl. No. 4: 16.

Jessup, R. E.,(1961).—Bean growing in N.S.W. Agric. Gaz. N.S.W. 72 (10): 544-50.

Jessup, R. E. (1961).—Clover phase boosts potato yields. Agric. Gaz. N.S.W. 72 (8): 411-3, 421.

Jessup, R. E. (1961).—College Challenger—New tomato variety. Agric. Gaz. N.S.W. 72 (7): 337, 365.

Jessup, R. E. (1961).—Growing capsicums (peppers). Agric. Gaz. N.S.W. 72 (9): 463-6, 479.

Macadam, A. C., Vane, N. and Colman, R. L. (1962).—Vetches (Golden Tares) on North Coast dairy farms. Agric. Gaz. N.S.W. 73 (1): 5-7, 40.

McDonald, D. J. (1961).—Aerial sowing of rice. Agric. Gaz. N.S.W. 72 (10): 505-8, 550.

McLean, I. (1962).—A farm-made thresher for pasture species. Agric. Gaz. N.S.W. 73 (6): 288-9, 314-5.

Murtagh, G. J. (1962).—Oats for winter forage on the north coast. Agric. Gaz. N.S.W. 73 (6): 282-3, 316-7.

Myers, Amy (1962).—Germination of sprung and shot seed wheat. Agric. Gaz. N.S.W. 73 (2): 64-5, 97, 99.

Simmons, K. V. (1962).—Establishing sub. clover on acid soils. Agric. Gaz. N.S.W. 73 (4): 183-8.

Spencer, R. T. (1961).—Carrots. Agric. Gaz. N.S.W. 72 (11): 570-4.

Strang, J. and Weir, R. (Chem. Br.) (1961).—The effect of biuret on pasture. Agric. Gaz. N.S.W. 72 (8): 424-5.

Sumeghy, J. B. (1961).—Breeding rockmelons for combined resistance to Fusarium Wilt and Powdery Mildew. Aust. Veg. Res. Newsl. No. 4: 18-9.

Sumeghy, J. B. (1961).—Tomatoes—Breeding and varieties: Progress report on Fusarium resistant canning tomatoes. Aust. Veg. Res. Newsl. No. 4: 34-5.

Walkden Brown, C and Fitzsimmons, R. W. (1961).—Oat varieties for 1962. Agric. Gaz. N.S.W. 72 (12): 617-21, 645-51.

Walkden Brown, C. and Fitzsimmons, R. W. (1962).—Wheat varieties for 1962. Agric. Gaz. N.S.W. 73 (2): 60-3, 85-94.

Walls, Frances (1962).—Dodder—Serious parasite weed. Agric. Gaz. N.S.W. 73 (3): 133-5.

Walls, Frances (1961).—Weed control in maize. Agric. Gaz. N.S.W. 72 (10): 532-3, 538.

Whalley, R. D. B. (1962).—Furrowing encourages revegetation of scalds. Agric. Gaz. N.S.W. 73 (3): 114-7, 149.

C. DIVISION OF HORTICULTURE

D. of A. Booklets

Anon.—Bridge grafting. 2nd ed. 3 pp.

Anon.—Early apricots. 2nd ed. 8 pp.

Anon.—Fruit fly folder. 5th ed. 4 pp.

Anon.—Home orchard calendar. 12th ed. 28 pp. (In conjunction with Division of Science Services.)

Anon.—Orange packing chart. 4th ed. 1 p.

Anon.—Preserving fruit and vegetables in the home. 3rd ed. 70 pp.

Anon.—Pruning fruit trees. 5th ed. 11 pp.

Anon.—Reworking apple and pear trees. 3rd ed. 19 pp.

Bryden, J. D.—Peach growing. 2nd Impression. 15 pp.

Bryden, J. D. and Mort, C. H.—Almond growing. 2nd ed. 35 pp.

Cann, H. J.—Establishing a banana plantation in N.S.W. 1st ed. 21 pp.

Cann, H. J.—Pineapple growing. 3rd ed. 25 pp.

Cox, J. E.—Fusarium resistant rootstocks for passion vines. 1st ed. 5 pp. (In conjunction with Biology Branch.)

Cox, J. E.—Fusarium wilt disease of passion vines. 1st ed. 2 pp. (In conjunction with Biology Branch.)

Gregory, G. R.—Chemical weed control in vineyards. 1st ed. 6 pp.

Holbeche, J. A.—Care of newly planted deciduous trees. 2nd end. 6 pp.

Holbeche, J. A.—Reworking stone fruit trees. 1st ed. 10 pp.

Levitt, E. C.—Citrus culture. 3rd ed. 73 pp.

Levitt, E. C.—Renovation of citrus trees. 4th ed. 24 pp.

Levitt, E. C. and McGillvray, K. D.—Growing passionfruit. 3rd ed. 22 pp.

Mort, C. H.—Olive pickling. 2nd ed. 6 pp.

Robinson, P. W.—The avocado. 3rd ed. 15 pp.

Skepper, A.—Concentrate spraying of deciduous fruit trees. 1st ed. 8 pp.

Whittaker, E. C.—After-care of buds and grafts. 4th ed. 7pp.

Whittaker, E. C. and Holbeche, J.A.—Budding pome and stone fruit trees. 3rd ed. 6 pp.

Contributions to Journals

Cann, H. J. (1962).—The banana growing industry of N.S.W. Agric. Gaz. N.S.W. 73 (5): 225-6, 244-5.

Cowell, N. D. (Nat. Coll. of Food Tech.) and Scott, K. J. (1962).—Variability of atmospheres produced by fruit stored in polyethylene box liners. J. Hortic. Sci. 37: 87-93.

Fuller, E. J. (1962).—Orange packing chart. Agric. Gaz. N.S.W. 73 (2): 66-7, 96.

Greenhalgh, W. J. (1961).—Centenary of an outstanding plum rootstock. Agric. Gaz. N.S.W. 72 (10): 526-31.

Greenhalgh, W. J. (1962).—Cherry pollination. Agric. Gaz. N.S.W. 73 (6): 284-6, 318.

Hall, E. G. (C.S.I.R.O. Div. Food Pres.), Scott, K. J. and Coote, G. G. (C.S.I.R.O. Div. Math. Stat.) (1961).—The control of superficial scald in cool stored Granny Smith apples. Aust. J. Agric. Res. 12: 834-53.

Hall, E. G. (C.S.I.R.O. Div. Food Pres.), Scott, K. J. and Riley, T. J. (C.S.I.R.O. Div. Food Pres.) (1962.—Control of superficial scald on Packham's Triumph pears. C.S.I.R.O. Food Pres. Quart. 22: 15-8.

Hall, E. G. (C.S.I.R.O. Div. Food Pres.), Scott, K. J. and Riley, T. J. (C.S.I.R.O. Div. Food Pres.) (1961).—The effects of ventilation on the development of superficial scald on cool stored Granny Smith apples. C.S.I.R.O. Div. Food Pres. Tech. Paper No. 25.

Johnson, J. F. (1961).—Bulk handling of pome fruits. Agric. Gaz. N.S.W. 72 (8): 400-6, 72 (9): 467-73.

Johnson, J. F. (1961).—Fruitgrowing in the Orange district. Agric. Gaz. N.S.W. 73 (4): 176-8, 211-2.

Leggo, D. and Seberry, J. A. (1962).—Double treatment improves mould control in citrus. Agric. Gaz. N.S.W. 73 (3): 127-8.

Scott, K. J., Hall, E. G. (C.S.I.R.O. Div. Food Pres.) and Riley, T. J. (C.S.I.R.O. Div. Food Pres.) (1962).—Superficial scald on cool stored Packham's Triumph pears. Agric. Gaz. N.S.W. 73 (2): 73-4.

Sweedman, R. (1962.—Fruitgrowing in the Young district. Agric. Gaz. N.S.W. 73 (1): 2-4, 36-9.

Vincent, A. E. (1961).—Pruning Williams pears on the M.I.A. Agric. Gaz. N.S.W. 72 (7): 352-60.

Vincent, A. E. (1962).—Summer pruning means better apple trees on M.I.A. orchards. Agric. Gaz. N.S.W. 73 (2): 57-9, 95-6.

Whittaker, E. C. and Greenhalgh, W. J. (1961).—Raising pear seedlings for rootstocks. Agric. Gaz. N.S.W. 72 (11): 564-6.

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Contributions to Journals

Barnett, L. G. (1961).—Owner—Sharefarmer team at Scone. Dairy Topics. 6 (6): 3-7.

Harper, N. (1961).—What you should know about milking machine releasers. Dairy Topics. 6 (4): 5-6.

Vernon, F. A. (1961).—Group herd recording 1959-60. Dairy Topics. 6 (6): 8-20.

Vernon, F. A. (1962).—Group herd recording 1959-60. Dairy Topics. 7 (1): 5-20.

Vernon, F. A. (1962).—Group herd recording 1959-60. Dairy Topics. 7 (2): 4-20.

Vernon, F. A. (1961).—Official recording of pure-bred registered cattle in N.S.W. For the year ended 30th June, 1959. Agric. Gaz. N.S.W. 72 (7): 370-8.

Vernon, F. A. (1961).—Official recording of pure-bred registered cattle in N.S.W. For the year ended 30th June, 1959. Agric. Gaz. N.S.W. 72 (8): 437-44.

Vernon, F. A. (1962).—Official recording of pure-bred registered cattle in N.S.W. For the year 1959-60. Agric. Gaz. N.S.W. 73 (5): 246-52, 262.

Vernon, F. A. (1962).—State summary of group herd recording 1959-60. Dairy Topics. 7 (3): 8-18.

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Steel, N. A.—Care and management of brood sows. 4th ed. 8 pp.

Contributions to Journals

Bootes, B. W. (1962).—A fatal paralysis in foals from *Ixodes holocyclus Neumann* infestation. Aust. Vet. J. 38: 68-9.

Bootes, B. W. (1962).—Poisoning of turkey poults with Lindane (B.H.C.) Aust. Vet. J. 38: 67-8.

Brann, V. H. (1962).—Market crisis seen as worst industry problem. Poultry. 45: 1.

Brann, V. H. (1962).—The production of more large hen eggs. Poultry Farmer. 29: 42.

Brann, V. H. (1961)-(1962).—Wire floors and litter-wire floor pens for layers. Agric. Gaz. N.S.W. 72 (10): 539-43, 72 (11): 598-600. (*Also* Poultry Notes, August.)

Brann, V. H. and Wilkins, S. J. (1961).—Housing poultry. Poultry Notes, July.

Brann, V. H. and Wilkins, S. J. (1962).—Laying cages: Use of electric lights for winter laying. Poultry Notes, July.

Carse, G. M. D. (1961).—Pig industry review. Land Annual: 107.

Christie, D. G. (1961).—Photosensitisation in stock. Agric. Gaz. N.S.W. 72 (10): 520-3.

Cramp, R. C. (1961, 1962).—Butchering on farm and station. Agric. Gaz. N.S.W. 72 (7): 380-8, 72 (8): 430-6, 72 (9): 493-500, 72 (10): 551-6, 72 (11): 602-12, 72 (12): 662-8, 73 (1): 48-52, 73 (2): 103-8, 73 (3): 158-64, 73 (4): 213-20, 73 (5): 271-7, 73 (6): 328-33.

Duff, P. J. (1961).—A hay feeder for cattle. Agric. Gaz. N.S.W. 72 (10): 514-7.

Dun, R. B. (1961).—Breeding merino sheep for higher lamb production. Wool Tech. and Sheep Br. 8: 9-11.

Dun, R. B. and Morrant, A. J. (1962).—Identification of merino rams homozygous for the poll gene. Aust. J. Agric. Res. 13: 69-81.

Golding, N. K. (1962).—Field and administrative aspects of the swine fever outbreak in N.S.W. Aust. Vet. J. 38: 123-8.

Gulliford, J. H. and Minty, R. M. (1962).—Hawkesbury Agricultural College ninth random sample test. Poultry Notes, January.

Gulliford, J. H. and Turner, J. A. (1962).—Hawkesbury Agricultural College, 60th egg laying competition, 1961-62. Poultry Notes, May.

Hebden, S. P. (1961).—The anthelmintic activity of Thiabendazole (M.K. 360). Aust. Vet. J. 37: 264-9.

Hebden, S. P. (1962).—Recent advances in anthelmintics for use in sheep. Aust. Vet. J. 38: 164-9.

Keast, J. C., Littlejohns, I. R. and Helwig, D. M. (1962).—Experiences in the laboratory diagnosis in swine fever of low virulence. Aust. Vet. J. 38: 129-37.

McDonald, M. W. (1962).—Research into poultry nutrition in Australia. World's Poultry Sci. J. 18 (1): 34-42.

McDonald, M. W., Dillon, J. F., Gulliford, J. and Dallimore, H. (1962).—Ninth random sample test—A survey of egg quality. Poultry Farmer. 29: 104-6. (*Also* Poultry Notes, April.)

Macindoe, R. N. (1962).—Work can be easy. Poultry Farmer. 29: 46, 48.

Mylrea, P. J. (1961).—Bovine infertility on the south coast of N.S.W. Aust. Vet. J. 37: 302-5.

Mylrea, P. J. (1962).—The differential daignosis of the causes of herd infertility in cattle. Aust. Vet. J. 38: 15-20.

Setchell, B. P. (1961).—Some effects of carbon-tetrachloride intoxication on liver and kidney function in sheep. Aust. J. Agric. Res. 12: 944-59.

Setchell, B. P., Harris, A. N. A., Farleigh, E. A. and Clark, F. L. (1962).—Further studies in lambs in N.S.W. on the growth response to selenium and the prevention of muscular dystrophy with selenium and Vitamin E. Aust. Vet. J. 38: 62-5.

Setchell, B. P. and Williams, A. J. (1962).—Plasma nitrate and nitrite concentration in chronic and acute nitrate poisoning in sheep. Aust. Vet. J. 38: 58-62.

Shelley, R. W. (1961).—Operating cradle for pigs. Agric. Gaz. N.S.W. 72 (8): 399-406.

Slennett, G. D. (1962).—First random sample test (turkeys), Wagga Agricultural College. Poultry Notes, June.

Smith, J. P. C. (1961).—Deep litter for poultry. Poultry Notes, October.

Smith, J. P. C. (1962).—Prospects of broiler growing in association with egg production. Poultry Farmer. 29: 54-6.

Smith, J. P. C. (1961).—Small unit flocks in the Hills district. Poultry Notes, November.

Smith, J. P. C. (1962).—These weeds can poison your poultry. Agric. Gaz. N.S.W. 73 (3): 136-42.

Smith, J. P. C. (1961).—Weeds harmful to poultry: their identification and control. Poultry Notes, September.

Steel, N. A. (1962).—Dairy pigs do better on deep litter. Agric. Gaz. N.S.W. 73 (5): 233, 253.

Wilkins, S. J. (1962).—The feeding of turkeys. Poultry Notes, March.

Wilkins, S. J. (1962).—The future outlook for turkey raising. Poultry Farmer, 29: 36-7.

Wilkins, S. J. (1962).—Marketing turkeys. Poultry Notes, April.

Wilkins, S. J. (1961).—Turkey raising—rearing. Poultry Notes, December.

Wilkins, S. J. (1962).—Turkeys are efficient converters of food. Poultry, 45: 23.

Williams, L. G. (1962).—Beef cattle improvement. Aust. Hereford J. 2: 22-3.

Williams, L. G. (1962).—Breeding productive beef cattle. Agric. Gaz. N.S.W. 73 (4): 172-5, 203-10.

Contributions to Technical Conferences

Dillon, J. F. (1962).—An investigation of the status of Vitamin B6 (Pyridoxine) in chicken diets. Proc. World's Poultry Cong., 12th, Sydney: 157-63.

Fowler, D. G. (1962).—The effect of changes in the daily photoperiod on the semen characteristics of the merino ram. Proc. Biennial Conf. Aust. Soc. An. Prod., 4th, Adelaide, 4: 58-62.

Dun, R. B. and Hayward, L. T. (Sth. Aust. Dept. Agric.) (1962).—The comparative performance of South Australian and Peppin Merino ewes. Proc. Biennial Conf. Aust. Soc. An. Prod., 4th, Adelaide, 4: 178-84.

Dun, R. B. and Wall, T. A. (1962).—Neonatal lamb mortality in flocks of merino ewes selected for and against fold development. Proc. Biennial Conf. Soc. An. Prod., 4th, Adelaide, 4: 187-9.

Holden, J. (1962).—Supplementary feeding of grazing ruminants and the effect on pasture intake. Proc. Biennial Conf. Aust. Soc. An. Prod., 4th, Adelaide, 4: 154-9.

Killeen, I. D. (1961).—Effect of nutrition, time of introduction of rams and shearing on the onset of oestrus in Border Leicester x Merino ewes in late spring—early summer. Proc. Conf. on Artificial Breeding in Sheep, Univ. N.S.W., Kensington.

McDonald, M. W. (1962).—Salt deficiency in laying diets: Proc. World's Poultry Cong., 12th, Sydney, 212-5.

McDonald, M. W. and Beilharz, R. G. (N.S.W. Milk Board) (1962).—Genetic variation in calcium metabolism in poultry. Proc. World's Poultry Cong., 12th, Sydney, 88-91.

Pattie, W. A., Armstrong, F. J. and Godlee, A. C. (1962).—The influence of the poll gene and castration on lamb growth. Proc. Biennial Conf. Aust. Soc. An. Prod., 4th, Adelaide, 4: 175-7.

Williams, A. J. and Dun, R. B. (1962).—A sampling technique for ranking hogget rams on wool production. Proc. Biennial Conf. Aust. Soc. An. Prod., 4th, Adelaide, 4: 49-52.

Williams, L. G. (1961).—Selection for maximal rate and efficiency of weight gain in beef cattle. Proc. Aust. Meat Bd. Subsidized Post Grad. Course in Beef Cattle Fertility, Camden: 197-209.

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Contributions to Journals

Anon. (1961).—Citrus blast. Agric. Gaz. N.S.W. 72 (7): 350-1.

Anon. (1962).—Curvularia leaf spot of gladiolus. Agric. Gaz. N.S.W. 73 (3): 125-6.

Anon. (1962).—Gummy stem blight or black rot of cucurbits. Agric. Gaz. N.S.W. 73 (1): 24-6, 40.

Anon. (1962).—Legume inoculant quality: 1961 commercial culture survey. Agric. Gaz. N.S.W. 73 (3): 122, 126.

Anon. (1961).—Lettuce diseases and their control. Agric. Gaz. N.S.W. 72 (11): 585-91.

Anon. (1962).—Major diseases of wheat. Agric. Gaz. N.S.W. 73 (4): 189-96.

Anon. (1961).—New plant diseases. Agric. Gaz. N.S.W. 72 (9): 489-91.

Anon. (1962).—Virus diseases of cabbages, cauliflowers and related plants. Agric. Gaz. N.S.W. 73 (1): 18-20, 39.

Anon. (1961).—Woody gall disease of citrus. Agric. Gaz. N.S.W. 72 (7): 348-9.

Blake, C. D. (1961).—Root rot of bananas caused by *Radopholus similis* (Cobb) and its control in N.S.W. Nematologica. 6: 295-310.

Braithwaite, B. M. (Ento. Br.) and Blake, C. D. (1961).—Tomato yellow top virus. Agric. Gaz. N.S.W. 72 (12): 627-9, 660.

Braithwaite, B. M. (Ento. Br.) and Blake, C. D. (1961).—Tomato yellow top virus: Its distribution, characteristics and transmission by the aphid *Macrosiphum euphorbiae* (Thom.). Aust. J. Agric. Res. 12 (6): 1100-7.

Conroy, R. J. (1962).—The beet eelworm. Agric. Gaz. N.S.W. 73 (2): 75-6, 98-9.

Conroy, R. J. (1961).—A field occurrence of *Fusarium solani* (Mart.) App. and Wr. forma *cucurbitae* Snyd. and Hans. on *Cucumis sativus* L. Aust. J. Sci. 23 (12): 412.

Conroy, R. J. (1961).—Mat disease of cultivated mushrooms. Agric. Gaz. N.S.W. 72 (9): 487-8.

Cox, J. E. (Div. Hortic.) and Kiely, T. B. (1961).—Fusarium resistant rootstocks for passion vines. Agric. Gaz. N.S.W. 72 (6): 314-8.

Hutton, K. E. (1961).—Bitter rot of apples. Agric. Gaz. N.S.W. 72 (6): 319-22.

McLeod, R. W., Roughley, R. J. and Richards, R. J. (1962).—*Staphylococcus aureus* in cheddar cheese. Aust. J. Dairy Tech. 17 (1): 54-6.

McLeod, R. W., Roughley, R. J. and Vincent, J. M. (Syd. Univ.) (1961).—The quality of legume inoculants produced under the supervision of U-DALS. Agric. Gaz. N.S.W. 72 (7): 362-5.

Pares, R. D. (1961).—Virus diseases of stone fruits in N.S.W. Agric. Gaz. N.S.W. 72 (12): 635-41, 659.

Pares, R. D. and Hutton, K. E. (1961).—Virus diseases of pome fruit in N.S.W. Agric. Gaz. N.S.W. 72 (8): 414-21.

Richards, R. J. (1961).—Bacteriology of cream and butter. Aust. J. Dairy Tech. 16 (3): 186-9.

Richards, R. J. (1961).—Dairy technology research in the United States of Amercia. Aust. J. Dairy Tech. 16 (3): 209-11.

Richards, R. J., Kennedy H. E. (Johnson and Johnson, New Brunswick, N. J.) and Gould, I. A. (Ohio State Univ.) (1962).—Antibiotic and bacteriophage interactions in antistreptococcal activity. Bact. Proc.

Richards, R. J., Kennedy, H. E. (Johnson and Johnson, New Brunswick, N.J.) and Gould, I. A. (Ohio State Univ.) (1961).—Antibiotic resistance and acid production among starter cultures belonging to the genus streptococcus. J. Milk and Food Tech. 24 (10): 317-20.

Roughley, R. J. (1962).—Some aspects of *Rhizobium* research and service in the N.S.W. Department of Agriculture. Agric. Gaz. N.S.W. 73 (5): 260-2.

Valder, P. G. (1961).—Flower blight of azaleas. Agric. Gaz. N.S.W. 72 (6): 323-5.

Contributions to Technical Conferences

Conroy, R. J. (1962).—The effects of air pollution on vegetation. Clean Air Conference, Univ. N.S.W., Kensington, Paper No. 8, 1st Technical Session: 18 pp.

Fraser, L. R. (1961).—Lemon crinkly leaf virus. Proc. Second Conf. International Organization of Citrus Virologists (November 1960): 205-11.

Fraser, L. R., Levitt, E. C. and Cox, J. (Div. Hortic.) (1961).—Relationship between exocortis and stunting of citrus varieties on *Poncirus trifoliata* rootstock. Proc. Second Conf. International Organization of Citrus Virologists (November 1960): 34-9.

(ii) ENTOMOLOGY BRANCH

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Reed, E. M.—The paralysis tick. 2nd ed. 9 pp. (In conjunction with Division of Animal Industry.)

Contributions to Journals

Anon (1962).—Ants. Agric. Gaz. N.S.W. 73 (3): 129-32, 157.

Anon (1961).—Book lice or psocids. Agric. Gaz. N.S.W. 72 (10): 537-8.

Anon. (1961).—Mites (acarina) in buildings. Agric. Gaz. N.S.W. 72 (9): 474-9.

Anon. (1961).—The passion vine hopper. Agric. Gaz. N.S.W. 72 (7): 361, 379.

Allman, S. L. (1961).—Registration and other problems in relation to pest destroyers. Agric. Gaz. N.S.W. 72 (8): 407-10, 436.

Braithwaite, B. M. (1961).—Yellow monolepta beetle. Agric. Gaz. N.S.W. 72 (11): 584, 612.

Braithwaite, B. M. and Blake, C. D. (Biol. Br.) (1961).—Tomato yellow top virus, its distribution, characteristics and transmission by aphid *Macrosiphum euphorbiae* (Thom.). Aust. J. Agric. Res. 12: 1100-7.

Braithwaite, B. M. and Blake, C. D. (Biol. Br.) (1961).—Tomato yellow top virus transmission by aphids and control. Agric. Gaz. N.S.W. 72 (12): 627-9, 660.

Gellatley, J. G. (1961).—Insecticidal treatment of cucurbits. Aust. Veg. Res. Newsl. No. 4: 17.

Gellatley, J. G. et al. (1961).—Ethylene dibromide fumigation for fruit fly sterilization in citrus. Aust. Hortic. Res. Newsl. No. 5: 33-7.

Gellatley, J. G. and Braithwaite, B. M. (1962).—Insect pests of tomatoes. Agric. Gaz. N.S.W. 73 (1): 27-35.

Gibson, F. A. (1962).—Use of nomographs for pest control problems. Agric. Gaz. N.S.W. 73 (5): 234-41.

Hely, P. C. and Gellatley, J. G. (1962).—Experiments on red scale control in coastal N.S.W. Agric. Gaz. N.S.W. 73 (2): 70-2, 100-2.

Hely, P. C. and Gellatley, J. G. (1962).—Red scale control investigations. Aust. Hortic. Res. Newsl. No. 6: 61-2.

Lloyd, N. C. (1962).—Systemic insecticides in the control of the woolly apple aphid. Aust. Hortic. Res. Newsl. No. 6: 56-9.

Lloyd, N. C. (1961).—The woolly apple aphid. Agric. Gaz. N.S.W. 72 (12): 652-4, 659.

Mosse-Robinson, I. (1961).—The spiny leaf insect. Agric. Gaz. N.S.W. 72 (9): 492.

Shanahan, G. J. (1961).—Genetics of dieldrin resistance in *Lucilia cuprina*. Genetica Agraria. 14: 307.

Watt, M. J. (1962).—Insect control in stored foodstuffs. Rampart 9 (11): 29-33.

Watt, M. J. (1962).—Protecting stored foodstuffs from these pests. Agric. Gaz. N.S.W. 73 (2): 77-84, Agric. Gaz. N.S.W. 73 (3): 143-5, 148.

Watt, M. J. (1961).—Skin and hide beetles (*Dermestes* spp.). Agric. Gaz. N.S.W. 72 (8): 426-7.

Watt, M. J. (1961).—What insects eat our grain. Pybuthrin Digest. 1 (3): 10-2.

Wright, W. E. (1961).—Cutworms and armyworms. Agric. Gaz. N.S.W. 72 (7): 366-9.

Wright, W. E. (1961).—The white fringed weevil. Agric. Gaz. N.S.W. 72 (12): 631-4.

(iii) CHEMISTRY BRANCH

D. of A. Booklets

Anon.—Lime sulphur. 2nd ed. 3 pp.

Contributions to Journals

Campbell, M. H. (Div. Pl. Ind.) and Barkus, B. (1961).—The effect of fertilizers on the crude protein content and palatability of serrated tussock (*Nassella trichotoma* (Nees.) Hack.) Aust. J. Exp. Agric. An. Husb. 1: 92-4.

Craig, D. P. (Univ. Coll. London.), Hollas, J. M. (Nat. Res. Council, Canada), Redies, M. F. and Wait, S. C. Jr. (Nat. Bur. Stand., U.S.A.) (1961).—Analysis of the naphthalene vapour absorption bands at 3200A (I. Naphthalene h-8). Phil. Trans. Roy. Soc., London, Ser. A, 253: 543-68.

O'Neill, D. K. and Alexander, A. E. (Syd. Univ.) (1961).—The effect of aging on the biological efficiency of some cattle-dipping formulations. Aust. J. Agric. Res. 12: 733-42.

(iv) BOTANY BRANCH

D. of A. Booklets

Watson, W. R.—The rose. 3rd ed. 44 pp.

Contributions to Journals

Anderson, R. H. (1962).—How to succeed in tree planting. Agric. Gaz. N.S.W. 73 (4): 169-71, 197-9.

Evans, O. D. (1962).—Araceae. Contrib. N.S.W. Nat. Herb. Fl. Ser. No. 22.

Evans, O. D. (1961).—*Typhonium brownii* Schott and some allied species. Contrib. N.S.W. Nat. Herb. 3 (2): 85-7.

Evans, O. D. and Johnson, L. A. S. (1962).—Palmae. Contrib. N.S.W. Nat. Herb., Fl. Ser. No. 21.

Tindale, Mary D. (1961).—Davalliaceae, Grammitidaceae, Polypodiaceae and Aspidiaceae. Contrib. N.S.W. Nat. Herb., Fl. Ser. Nos. 208-11.

Tindale, Mary D. (1961).—Studies in Australian Pteridophytes. No. 3. Contrib. N.S.W. Nat. Herb. 3 (2): 88-92.

Vickery, Joyce W. (1961).—Contributions to the taxonomy of Australian grasses. II. Contrib. N.S.W. Nat. Herb. 3 (2): 83-4.

Vickery, Joyce W. (1961).—Gramineae. Contrib. N.S.W Nat. Herb., Fl. Ser. No. 19, part 1.

Watson, M. A. (1962).—Good gardens begin with good design. Agric. Gaz. N.S.W. 73 (3): 118-9, 150-3.

G. DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS

D. of A. Booklets

Anon.—Getting started in farming. 6th ed. 63 pp.

Contributions to Journals

Bird, J. G. (1962).—The dairy industry on the far north coast of N.S.W. Rev. Mark. and Agric. Econ. 30 (1): 13-70.

Donaldson, G. F. (1962).—Economics, advertising and wool. Rev. Mark. and Agric. Econ. 30 (1): 5-12.

McFarlane, G. C. (1961).—Price arrangements for dairy products. Rev. Mark. and Agric. Econ. 29 (3): 105-11.

Mason, G. (1961).—A reconsideration of net profit as a measure of financial success in farming. Rev. Mark. and Agric. Econ. 29 (3): 148-55.

Throsby, C. D. (1961).—Economic aspects of superphosphate use. Wool Tech. and Sheep Br. 8 (1): 45-8.

Throsby, C. D. (1961).—Fitting production function to experimental data. Rev. Mark. and Agric. Econ. 29 (3): 112-47.

Throsby, C. D. (1961).—Game theory and a time-of-market decision. Aust. J. Agric. Econ. 5 (1): 9-22.

Throsby, C. D. (1962).—Some notes on "dynamic" linear programming. Rev. Mark. and Agric. Econ. 30 (2): 119-41.

Contributions to Technical Conferences

Throsby, C. D. (1962).—Some applications of dynamic programing in agricultural economics. Symposium on Optimization Procedures in Busines and Industry, Syd. Univ.; 12 pp.

H. AGRICULTURAL RESEARCH INSTITUTE, WAGGA WAGGA

D. of A. Booklets

Butler, F. C.—Root and foot rot diseases of wheat. 98 pp. (Science Bulletin 77.)

Contributions to Journals

Cuthbertson, E. G. (1961).—Chemical control of skeleton weed in crops. Agric. Gaz. N.S.W. 72 (7): 345-7.

Cuthbertson, E. G. (1961).—Control of capeweed in pastures. Agric. Gaz. N.S.W. 72 (12): 630, 661, 668.

Single, W. V.* (1961).—Studies on frost injury to wheat. I. Laboratory freezing tests in relation to the behaviour of varieties in the field. Aust. J. Agric. Res. 12: 767-82.

* At the time of publication address was Tamworth Agricultural Research Station.

Contributions to Technical Conferences

Bird, L. H. (1961).—Quality assessment of wheat breeders' material. Conf. Cereal and Pasture Plant Breeders, Canberra, 1: (2) 1-5.

Pugsley, A. T. (1961).—Varietal adaptation. Conf. Cereal and Pasture Plant Breeders, Canberra, 1: (1) 1-5.

Symes, K. J. (1961).—Backcrossing for quality. Conf. Cereal and Pasture Plant Breeders, Canbera, 1: (3) 1-7.

I. AGRICULTURAL RESEARCH STATION, TAMWORTH

Contributions to Technical Conferences

Single, W. V. (1961).—The development of some wheat varieties in relation to natural environmental factors. Conf. Cereal and Pasture Plant Breeders, Canberra, 1: (6) 1-9.

J. LEGAL BRANCH

D. of A. Booklets

Anon.—Farm tenancy. 3rd ed. 71 pp.